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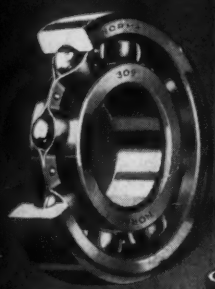

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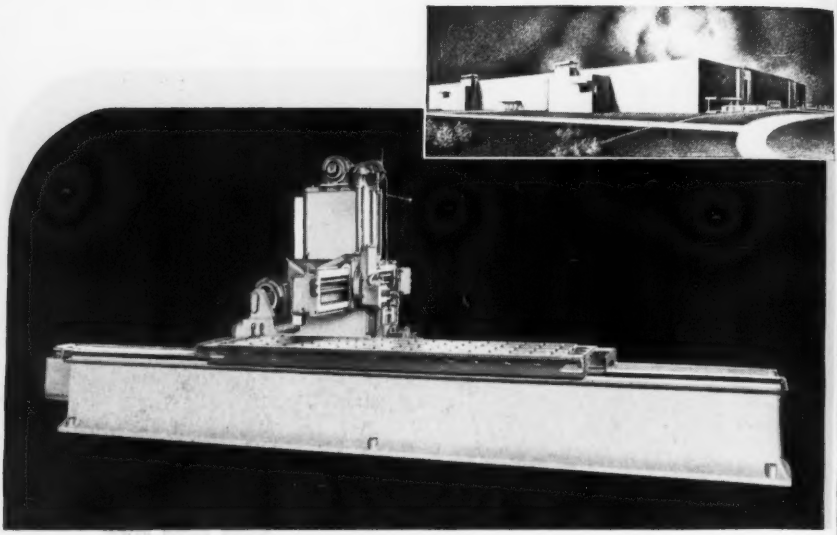

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MODERN Machine Shop

A Magazine for Machine Shop Executives
HOWARD CAMPBELL, Editor

Vol. 4 **JUNE, 1931** **No. 1**

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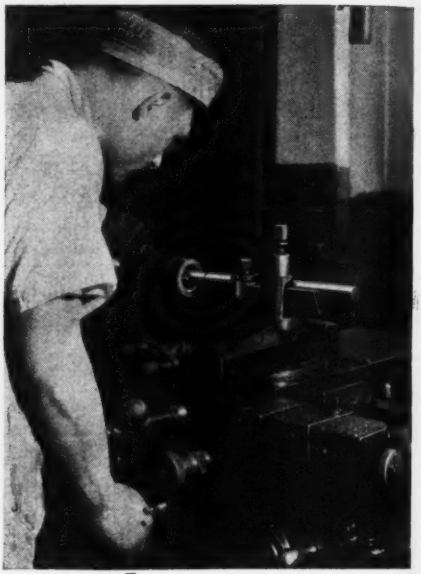

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MODERN Machine Shop

JUNE, 1931

CINCINNATI, OHIO VOL. 4, NO. 1

Clamps For Jigs and Fixtures

A Discussion of Efficient Locating and Clamping Methods

By FRANK W. CURTIS

PRACTICALLY all jigs and fixtures require clamps of one type or another, for the purpose of holding the workpiece solidly in place while it is being machined. The selection of a clamp for a given tool depends entirely upon the nature of the part to be held and the type of jig or fixture to be made. In cases where an inexpensive tool is required, a simplified clamp will suffice, but when large output is a factor, it will be economical to use the most efficient clamp regardless of cost, because where only a few seconds are gained the computed savings over a large run will more than compensate for the added expense involved.

The loading time of any operation should be as brief as possible, so that the machine will be in actual operation almost constantly. It is for this reason that indexing tables with two fixtures and other similar arrangements are used, in order to permit the loading of one unit while the other is in use. However, this method cannot always be adopted, which means that single tools must be used. Hence, loading becomes a factor that should be carried out with a minimum of lost motion. For this reason, the selection of a clamping method becomes an important consideration.

Since each workpiece presents a different clamping problem, it would be impossible to formulate rules that would apply for general-purpose work. This means that a careful

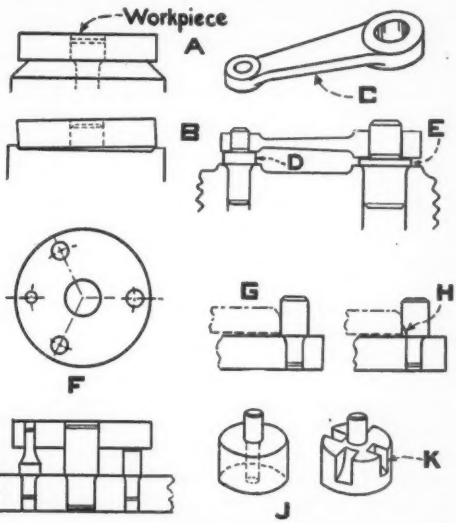

Fig. 1—Proper clamping depends upon correctly-designed locating surfaces. Here are illustrated a few examples of both good and bad methods of locating work.

individual analysis should be made of each problem. Perhaps the best assistance in this direction is to have layouts of several clamp designs available for reference, which will, of course, offer suggestive ideas, and very often solve the problems in question. The designs shown here are for this purpose. To some extent,

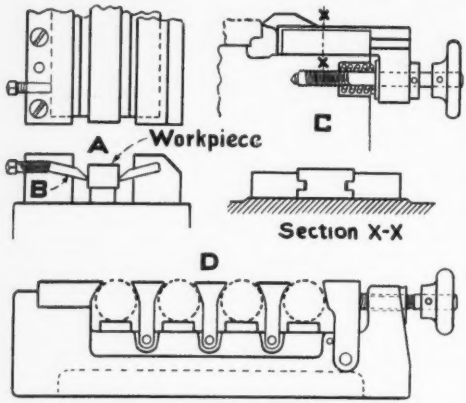

Fig. 2—A variety of clamping methods.

they will augment the clamps illustrated in a recent series of articles, "Modern Tooling Practice," which appeared in MODERN MACHINE SHOP.

Workpieces to be clamped must be located solidly so that the clamp itself will function properly. Too often is a clamp blamed for distortion or misalignment when the fault lies in the method of location. Chips quite frequently interfere with location of a workpiece, but a clamp cannot be expected to correct the fault. Therefore, before selecting a suitable design of clamp, be sure that the locating methods are correct. One is equally as important as the other.

It is always better to have the locating surface slightly smaller than the surface of the workpiece being clamped, as shown at **A** in Fig. 1. This will facilitate cleaning because chips and dirt will not be so likely to lodge on the locating surface after a piece has been removed. When the locating surface is larger than the workpiece, a depression may be worn in the top face, as shown at **B**, which might cause the piece to become cocked or misaligned, especially if its profile should be slightly irregular. Such a condition can easily happen with castings or forgings that are made from different patterns or dies.

In locating a piece such as that shown at **C**, the studs should be smaller, as outlined at **D** and **E**. Parts of this kind are likely to vary in shape just enough to cause trouble if the locating faces of the studs are larger than the surfaces being located. When larger parts are to be clamped, it is often possible to cut away the locating surface so as to reduce the area of contact. Sometimes studs can be used as shown at **F**, a construction having many advantages, especially from a standpoint of chip interference. When pins are used to locate the edges of workpieces, as shown at **G**, it will be well to cut away the bottom corner of the pin as illustrated at **H**, so that dirt will not obstruct correct location. Another excellent suggestion in this direction is to cut away the face of locating studs, as shown at **J**, by cutting out three or four slots **K**, because full resting surfaces are seldom needed. The slots will aid in avoiding incorrect location as a result of chip interference.

Always remember that much depends on jigs or fixtures, and that it is well to start right by providing correct locating methods. With this assured, the next step is to select a suitable means of clamping.

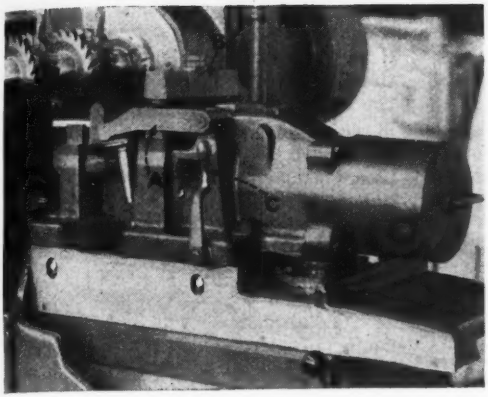

Fig. 3—Air-operated fixture for straddle-milling steering spindle forgings in a Mil-Waukee-Mil.

The clamp shown at **A**, in Fig. 2, resembles hold-downs used in connection with a shaper. The idea can be applied to parts that require a long clamping contact. One side can be made as a solid block if desired, and if the workpiece permits. The adjustable blade **B** is fitted into a slot in such a way that it strikes the work at a slight angle, thus having a tendency to not only offer proper clamping, but also to locate the work solidly against the locating plate. The clamp at **C** is of the sliding type and is also made so that the contacting point offers a hold-down action. At **D** is shown a method of clamping several pieces at one time, with the use of a single clamping screw. An arrangement of this kind has many uses. The same principle can be applied for holding two or three pieces, or even more than four, in certain cases.

Fig. 3 illustrates an air-operated fixture for straddle milling steering spindle forgings as set up in a Mil-Waukee-Mil. Two pieces are held in the fixture, one on each side, although only one is to be seen. Hinged-type clamps, as shown at **A**, hold the forgings in place. Clamping pressure is obtained from and transferred to the clamps by the cross bar **B**, which is attached to a vertical shaft that is operated from an angular plunger connected to the plunger of the air cylinder. The cross bar is pivoted so that it can be turned at right angles after the clamping pressure has been released, and thus allow the hinged clamps to be thrown back to facilitate unload-

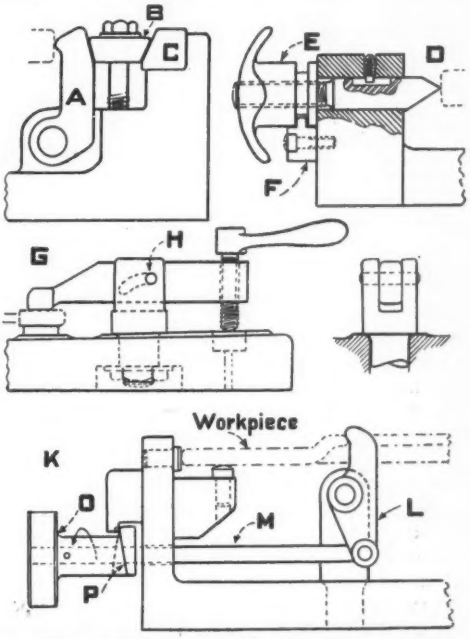

Fig. 4—Hinged and sliding-pin type clamps.

ing. After two pieces have been loaded, the clamps are dropped in place, the cross bar is turned 90 degrees, and the handle **C** is engaged to operate the air cylinder. Clamps of this kind offer many possibilities, especially when used with air cylinders.

In Fig. 4 are shown several clamps,

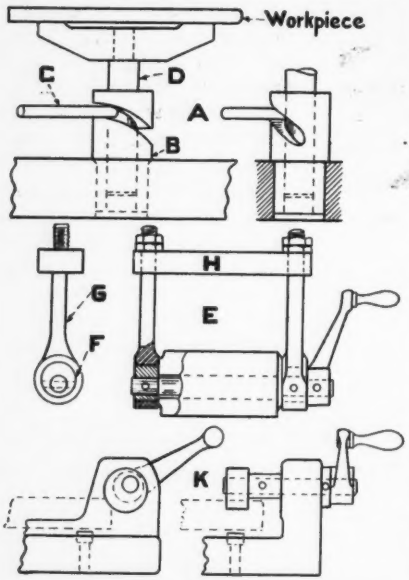

Fig. 5—Cam-actuated clamps.

the design at **A** being of the hinged type and controlled by a wedge **B** that contacts against the back face of the clamp and the hardened angular plate at **C**. A clamp of this type offers a very firm grip and is not difficult to construct. The clamp shown at **D** is of the sliding-pin type, and is operated by the handwheel **E**. The handwheel is restrained from moving in or out by the plate **F**, which is attached to the fixture body. A set screw is used to prevent the sliding pin from rotating when the handwheel is turned.

Very often it is necessary to provide a clamp that clears the work when it is withdrawn, and such a design is shown at **G**. This clamp is of the hinged type, and is made with a cam slot at the inside so that when it is withdrawn, the pin **H** will cause the clamp to raise sufficiently to clear the work. The design shown at **K** is valuable when it is necessary to clamp a piece from an inside surface. The clamp **L** is of the hinged type, and is operated by means of the hook bolt **M**, which is attached to the handwheel **O**. When the handwheel is rotated, the cam face **P** causes the bolt to move inward, thus causing the heel of the clamp to go with it. The clamp, being pivoted, naturally seats itself against the work, offering a secure grip.

Another form of cam clamp is illustrated at **A** in Fig. 5, consisting of a bushing **B** which is made with a cam slot arranged so that the pin **C** slides in it. The pin, in turn, is attached to the elevating bar **D**, to which the clamp is attached. A clamp of this type can be arranged for either horizontal or vertical operation. The dwell of the cam can be made so that a rapid elevating motion can be provided to bring the clamp to the work, and then a gradual dwell so that a positive clamping action is attained. At **E** is shown a clamp that is made with two eccentrics **F** that operate the two pins **G**, causing them to engage the clamp plate **H**. This clamp is actuated by means of the handle, arranged so that only one stroke is required to complete the clamping of the piece. Several clamps of this type are offered by small tool manufacturers, their designs being applicable to a large variety of drilling jigs. The clamping arrangement shown at **K** is also of the cam type, although in this case the cam bears directly against the workpiece. The cam is mounted on a pin, on the other end of which is located a handle for operating purposes. This design is somewhat inexpensive, but at the same time is very efficient for use in grinding and milling fixtures.

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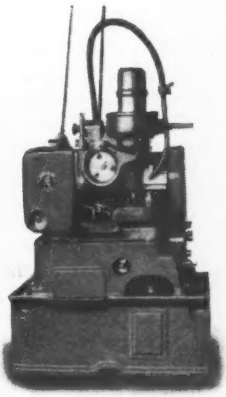

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In certain cases it is somewhat necessary to provide a clamp of the floating type, and thus overcome any possibilities of distorting or straining the workpiece. Floating clamps are usually applied to parts that vary in size enough to warrant their use. Such an example is shown in Fig. 6, which represents a floating clamp for the clamping of a projecting member of a workpiece as shown at **A**, which fluctuates sufficiently to prohibit the use of a fixed clamp. The body of the clamp consists of a plate **B**, on which a knife edge **C** is located. Directly opposite the knife edge is located a hinged clamp which is operated by a clamping screw. The entire plate floats on a pin **D**, so that when the clamp is tightened, the plate floats to suit the variation in the work. As soon as the clamp has been tightened, the plate **B** is locked in place by means of the small handwheel **E**. At the lower portion of the illustration at **G** is shown a similar type of clamp, although in this case the body is made as a sliding member, which in turn slides in a slot. The clamping of the piece is done by means of a stationary knife edge **H** and an adjustable clamp **K**. The entire slide **L** moves one way or another to suit the variation in the work. After the work has been securely clamped, the slide is locked in place by means of the small handwheel **M**. Clamps of this type will find many useful purposes, and in a great many cases will simplify the design of a jig or fixture to a great extent.

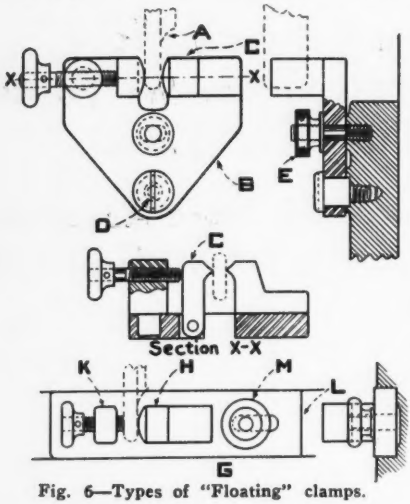


Fig. 6—Types of "Floating" clamps.

The clamp shown at the top of Fig. 7 is a rather useful design for the holding of small work. The example shows a complete drill jig used for the drilling of a small hole in a shouldered pin. The clamp **A** is pivoted on a pin **B** in such a way that it can be swung to one side in order to simplify the removal of the piece. When it is brought into the clamping position, the pin **C** strikes the flattened portion of the screw head so that the correct clamping position is attained. When the clamp is swung out of the

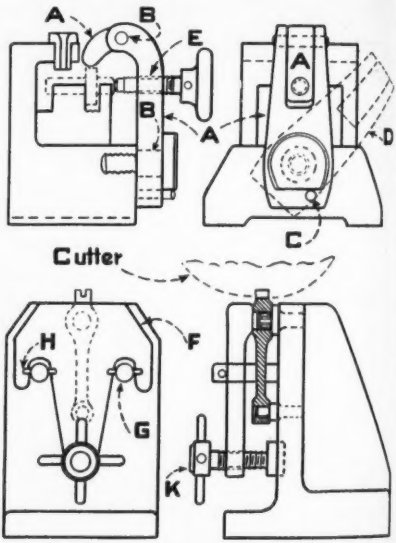
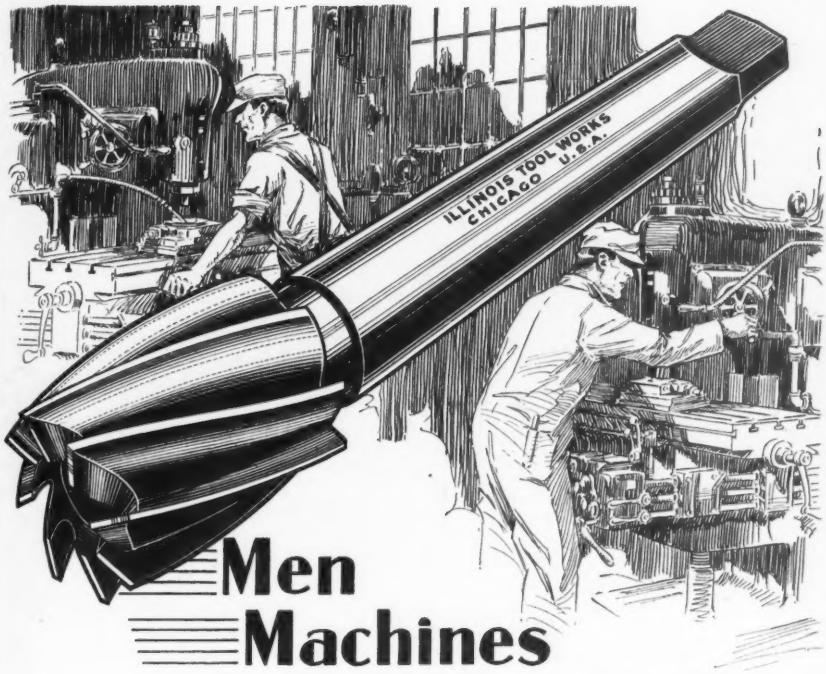


Fig. 7—Hinged and removable-type clamps.



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way, it takes the position shown by the dotted line **D** and, likewise, the pin **C** strikes the opposite face of the screw head, so that it is prevented from going too far. In this example, the clamp is made with a hinged yoke,

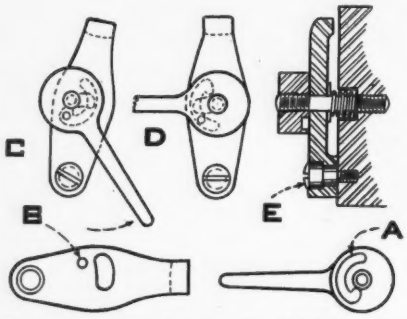


Fig. 8—A clamp that can be shifted to one side to facilitate changing work.

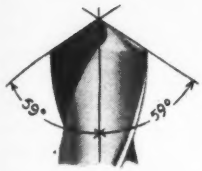
constructed so that it clamps the work on the shouldered portion, holding it down securely, while at the same time the end of the clamping screw **E** forces the workpiece into the proper location.

Sometimes the nature of the work is such that it is necessary to remove the clamp entirely to load and unload the workpiece. Such a case is shown at the lower portion of Fig. 7, which represents a small milling fixture for the slotting of one end of a small link. The workpiece is fitted over two studs and naturally requires freedom for removal. The clamp **F**, in this case, is made so that it can be removed quickly. It fits over two pins **G**, which are provided with small cross pins as shown at **H** to offer a fulcrum point for the clamp. Operation is by means of the screw **K**. After a piece has been milled, clamping pressure is relieved by operation of the screw, then the clamp is raised up a slight amount so that it can clear the pins **G**, after which it is removed entirely. The workpiece is then withdrawn and another piece is put on, after which the clamp is again put in place and again adjusted to tighten the work.

The clamping arrangement shown in Fig. 8 will be found very useful in cases where it is necessary to shift the clamp to one side in order to remove the piece being clamped. The design is such that the clamp plate is adjusted sidewise, and also locked in place by single motion of the clamping lever. The bottom face of the clamping lever is made with a cam slot as shown at **A**, which fits over the pin **B** attached to the clamp. When the clamp is released and in the loading position, it appears as shown at **C**, whereas after it has been adjusted to the workpiece and clamped, it has the position shown at **D**. The same principle can be applied for sliding the clamp back away from the work by eliminating the use of the shouldered pin **E**, and providing in its place a heel plate of a suitable design. Likewise, the elongated slot in the clamp would be made lengthwise rather than as shown.

"Grinding of Cemented Tungsten Carbide"

The series of booklets on the various phases of grinding that has been issued by the Norton Company, Worcester, Mass., has been augmented by the addition of a booklet titled "Grinding of Cemented Tungsten Carbide." The booklet tells what tungsten carbide is, what the outstanding properties of this material are, how it is cemented, and how it should be ground. Methods of grinding are discussed in detail and instructions are given for grinding the various kinds and types of tools. Difficulties that will be met with are outlined, with suggested remedies. Instructions for lapping and honing are included. The book is profusely illustrated with photographs showing how the grinding operations should be performed and the kind of equipment that should be used. A copy of the booklet can be obtained by addressing the Norton Company, Dept. M, Worcester, Mass.

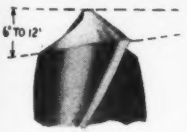


Clearance Angle
The lips of this drill are of the same angle to the axis of the drill. Absolutely essential for accuracy

Lip Clearance
(a) clearance at (a) should be more than clearance at (b) The value of increasing clearance at the point (a) determines the value of the dead center angle and the efficiency of the drill

Dead Center
Dead center in exact relation to cutting lips. This angle should vary with lip clearance for maximum endurance

Lip Length
The lips are ground exactly the same length to give the greatest efficiency. Absolutely essential for accuracy



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A Well-Designed Toolcrib Saves Productive Hours

By J. B. O'CONNOR
Chief Engineer, Lyon Metal Products, Inc., Aurora, Ill.

RECENT years have seen remarkable progress in the development of machinery, tools, and processing methods, as well as in the methods of handling materials through the shop —all leading toward the goal of increased production and lower costs. The mechanical units, while more accurate and more productive, are more complicated and more expensive, both as to first cost and maintenance, therefore it is highly important that production shall be interrupted as seldom, and for as short a time, as possible. Particularly is this the case where the piece rate or bonus method of wage payment is used.

It is probable that the one item which occasions more lost time than any other single item in shop operation is the necessity of going to the toolcrib for tools. Time spent in walking back and forth and at the crib is a dead loss, yet the toolcrib method of storing and dispensing tools is generally accepted as the best method thus far devised. Consequently the storage and handling of tools, dies, fixtures, and so on is an important factor in machine shop operation, and

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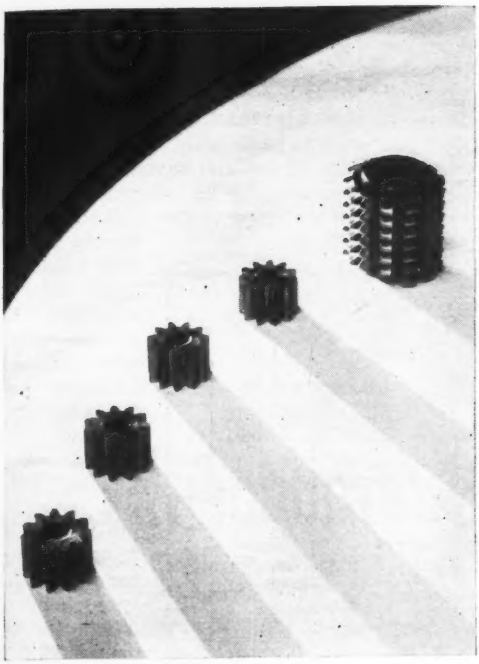


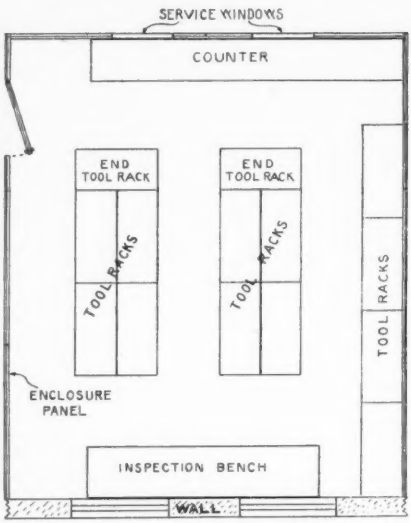
A good gear always goes back to a good hob

Given proper production conditions, if the hob is right, the gear is bound to be right, also. But the hob must be right, for the reason that every minute detail of the hob tooth profile is faithfully reproduced in the gear blank during the hobbing process. . . Barber-Colman Hobs are made on specially designed machines to a greater degree of accuracy than is commonly obtained in hob manufacture. Every step of their production is carefully checked, and final tests include lead and form checks on standard gear hobs, sample checks on spline shaft and formed hobs, and stereopticon projection of profile of sample for particularly close work. . . Isn't it reasonable to expect better gears from Barber-Colman Hobs? That is exactly what our customers tell us they are obtaining. . . May we send you further information?

BARBER-COLMAN COMPANY
General Offices and Plant
ROCKFORD, ILLINOIS, U. S. A.

one that has been studied from every conceivable angle. The demand for adequate, standardized tool storage facilities has fostered the development of especially-designed tool storage equipment that can readily be adapted to any modern production plan. Such equipment has recently been installed in a large number of metal-working plants.

In considering the factors that determine the location, operation, and equipment of the toolcrib, it should be borne in mind that the principal object of the toolcrib is to supply the needs of the mechanics as speedily as possible and thus reduce lost productive time to the minimum. Hence, the first point to be considered is that of accessibility. The location of the toolcrib should be as central as possible, so that everyone using it may reach it quickly. Sufficient aisle space should be provided in front of the windows to prevent crowding or confusion among those waiting to be served.



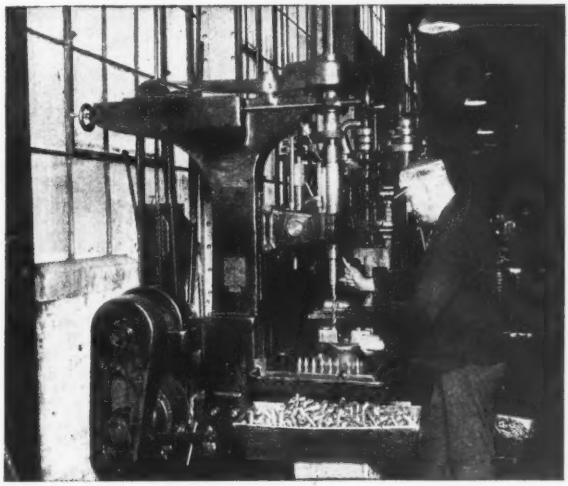
Typical Toolcrib Floor Plan.

Trays should be provided into which the tools that are returned may be placed if there is any question as to whether or not they are dull, broken, or damaged. Such tools are later transferred to the tool inspection bench where they may be examined carefully before being returned to their proper places in the racks. The inspection bench should be located near a good source of light, and should be equipped with all necessary tools for inspection and hand repair work. In some shops all returned tools are inspected before they are returned to the racks and any cutting tools that have been used are ground before they are given out again.

The next point to be decided is the actual size and physical makeup of the toolcrib and its equipment. It will be necessary to have a shelf or counter across the "window" side of the crib, on a level with the bottoms of the windows, over which the business of checking the tools in and out may be transacted. As a general rule, it will be found most satisfactory to have this counter approximately 40 inches high and 18 inches deep. This is not only a convenient height for the average man, but it is also just high enough to allow the use of specially-designed racks for cutters, as shown in the illustration at the head of this article.

At right angles to this counter, and far enough back to provide plenty of working space, should be two or more double-face steel racks, each seven feet high and 18 inches deep on each side, for the storage of drills, reamers, and other frequently-used tools. The space at the front ends of these double-face racks can also be utilized by placing racks three feet wide, seven feet high, and 18 inches deep at the front end of each rack so that they

(Continued on page 26)



Avey

DOUBLED PRODUCTION on this job

EVERYWHERE . . . throughout industry . . . you hear the call for greater speed and efficiency in production that involves drilling. AVEY Drilling Machines answer this call . . . increasing production, saving handling, and reducing costs.

The illustration shows an AVEY Drilling Machine being used in the manufacture of parts for a high grade motor car. Production on this job was increased 100 per cent by installing an AVEY.

What is your problem? AVEY Drilling Machines have effected many startling economies in a wide range of industrial plants. They will do the same for you! Let our engineers make a suggestion . . . without obligation!

THE AVEY DRILLING MACHINE CO.

CINCINNATI, OHIO

We are interested in drilling machines for the following work:

.....

Name.....

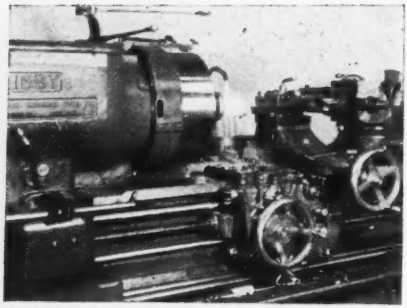
Firm.....

Address.....

City.....State.....

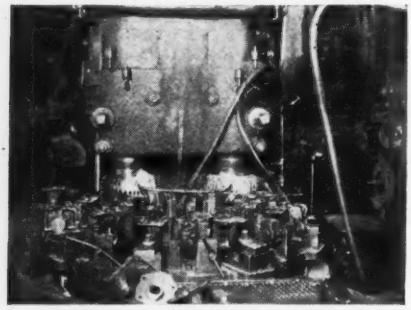
FASTER WORK . . . BETTER

On practically all types



Courtesy of International Machine Tool Co., Indianapolis, Ind.

OPERATION: TURNING AND DRILLING CROSS HEAD PIN.
MACHINE: 3H." LIBBY TURRET LATHE.
MATERIAL: .45 CARBON STEEL.
TOOLS: CARBOLOY.
STOCK REMOVED: 2 INCHES.
FEED: ⅛ INCH.
SPEED: 125 R. P. M.
TIME: 11 MINUTES.
LUBRICANT: 1 PART SUNOCO TO 15 PARTS WATER.



Courtesy of Warner Corporation Muncie, Ind.

OPERATION: SURFACE MILLING STEERING GEAR CASES.
MACHINE: NEWTON NO. 50 VERTICAL MILLER.
MATERIAL: MALLEABLE IRON.
CUTTERS: 12 INCH DIAMETER, INSERTED TOOTH.
WIDTH OF CUT: 11 INCHES.
DEPTH OF CUT: ⅛ INCH.
SPINDLE SPEED: 65 R. P. M —180 S. F. P. M.
FEED: 24 INCHES PER MINUTE.
PRODUCTION: 144 PIECES PER HOUR.
LUBRICANT: 1 PART SUNOCO TO 20 PARTS WATER.

WHATEVER the nature of metal parts you manufacture—let it be gears, nuts, bolts, ball-bearings or small typewriter parts—whether your equipment consists of lathes, millers, threaders, slotters or grinders—if you work in brass, bronze, copper, aluminum, machine screw stock, high carbon or alloy steels or monel metal, you will find the Sun Oil Company produces cutting lubricants of outstanding efficiency for your work.

In Sunoco Emulsifying Cutting Oil, for instance, you have available a lubricant most widely and favorably known in the trade for its aid in producing faster work with better finish at lower costs. A roll call of Sunoco users reads like a "Who's Who" of the metal working industry. It has long been our privilege, as it is now, to show typical examples of how Sunoco is serving efficiently and economically in leading metal cutting plants.

SUN OIL COMPANY, Philadelphia, U.S.A.

SUN

EMULSIFYING

Made by SUN OIL CO. *producers*

AKRON, ALBANY, ALLENTOWN, ATLANTIC CITY, BALTIMORE, BATTLE CREEK, BEAUMONT, BINGHAMTON, BRIDGEPORT, BUFFALO, CHICAGO, CINCINNATI, CLEVELAND, COLUMBUS, DALLAS, DAYTON, DETROIT, FLINT, GRAND RAPIDS, HARRISBURG, JACKSON, MICH.

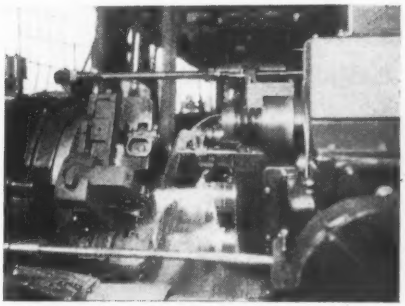
FINISH . . . LOWER COSTS *of metal or machines*

IN your own shop, SUNOCO Emulsifying Cutting Oil will:—

1. *Mix easily and stay mixed.*
2. *Be an ideal refrigerant as well as lubricant.*
3. *Act as perfect rust preventive.*
4. *Prevent system from clogging.*
5. *Require less frequent cleaning of the system.*
6. *Permit higher speeds and heavier cuts with better finish.*
7. *Never turn rancid, for it contains no animal or vegetable fats.*
8. *Prove to contain no rosin or rosin oil.*
9. *Keep workmen's hands in better condition.*

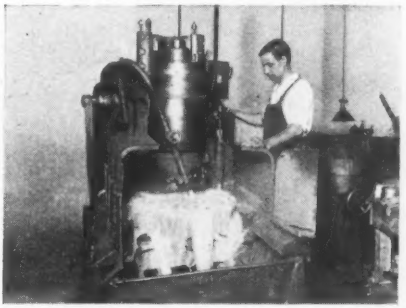
SUN OIL COMPANY ENGINEERS have offered many valuable suggestions at no cost to manufacturers for increasing outputs and lowering production costs. Prompt and intelligent attention is given to all inquiries addressed direct to Headquarters or to any of our branches.

SUN OIL COMPANY, Ltd., Montreal, Canada.



Courtesy of Warner Corporation, Muncie, Ind.

OPERATION: DRILLING, REAMING, SPOT FACING AND TAPPING STEERING GEAR CASES.
MACHINE: GOSS & DE LEEUW AUTOMATIC.
MATERIAL: MALLEABLE IRON.
SPINDLE SPEED: 200 R. P. M.
FEED: 240 FEET PER MINUTE.
TAP: 2 INCH DIAMETER, 16 PITCH.
PRODUCTION: 180 PIECES PER HOUR.
LUBRICANT: 1 PART SUNOCO TO 20 PARTS WATER.



Courtesy of Foote Bros., Gear and Machine Co. Chicago, Ill.

OPERATION: GRINDING GEAR BLANKS, 18 AT A TIME.
MACHINE: BLANCHARD SURFACE GRINDER, 26 INCH ONE-PIECE MAGNETIC CHUCK.
MATERIAL: SOFT STEEL.
WHEEL: NORTON SILICATE 16 INCH X 5 INCH X 1½ INCH.
WHEEL SPEED: 1000 R. P. M.
LUBRICANT: 1 PART SUNOCO TO 40 PARTS WATER.

SUNOCO
CUTTING OIL
of BLUE SUNOCO MOTOR FUEL

JACKSONVILLE, MIAMI, MONTREAL, NEWARK, NEW YORK, OTTAWA, PHILADELPHIA, PITTSBURGH, PROVIDENCE, QUEBEC, QUINCY, READING, ROCHESTER, SCRANTON, SYRACUSE, TAMPA, TOLEDO, TORONTO, TRENTON, TULSA, WILMINGTON

Toolcrib Saves Productive Hours

(*Continued from page 22*)

will face toward the receiving counter.

Experience has shown that the sizes given above are the most convenient, most economical in the use of space, and most adaptable. It has also been found that, in order to obtain the best results, it is absolutely essential that the racks be designed for the specific purpose of storing tools. The use of makeshift equipment with ordinary flat shelving is false economy. By having the tools properly placed in these racks, it will be possible for the attendant to reach tools required on probably half the calls without taking more than one or two steps away from the serving window.

In determining the exact manner in which the various kinds and sizes of tools are to be stored, the designer has the option of placing the tools on flat shelves, in compartments of proper size with shelves sloped toward the front at an angle of 7½ inches in 18 inches depth, of using flat trays or drawers, of hanging the tools on pegs, or of storing them in boxes. The decision regarding the adoption of these various methods should be governed by the amount of visibility, accessibility, and compactness available. Sloping shelves should not be used below a height of 2½ feet from the floor nor above five feet from the floor, as the contents cannot readily be seen below or above these heights. Trays and boxes should not be placed so that the tops will be more than five feet above the floor, although they can be used successfully at any point below this height. Tools hung on pegs can be reached most conveniently when they are hung from 2½ feet to six feet above the level of the floor.

No. 2 Lyons Inserts used for storing drills, reamers, taps, and dies at the G. A. Gray & Co. plant in Cincinnati, O.

Here's the simple solution

to many seemingly complicated drive problems

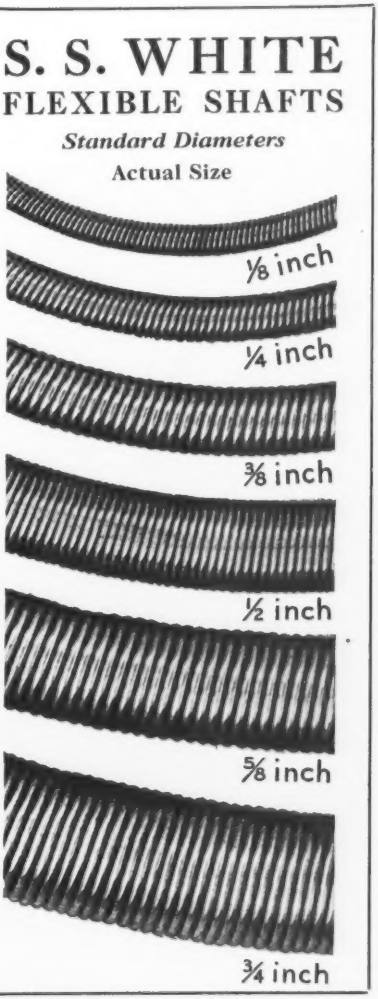
FORMERLY when engineers and designers were confronted with a drive problem where a straight, solid shaft could not be used, they had no recourse but to turn to more or less complicated combinations of bevel gears, belts and pulleys, chains and sprockets, universal joints and similar cumbersome methods of transmission.

Now-a-days up-to-date engineers and designers, when faced with such a drive problem, turn first to the flexible shaft—a single, self-contained unit that is simply connected at one end to the driving element and at the other to the driven—from every angle the simplest substitute for the solid shaft.

And the development by S. S. White of shafts of larger diameters, has greatly increased the range of drive problems that can be solved by this simplest and most direct method. Look at the ¾" shaft above. Built up practically solid of layers of the toughest steel wire obtainable, it combines with flexibility the strength to handle comparatively heavy drives, with reliability and durability amply proved by performance of thousands and thousands of feet in actual use.

Full information and data on flexible shafts will be furnished anyone interested on request.

For the solution of any specific drive problem, we offer expert engineering co-operation that already has been instrumental in working out a great variety of shaft applications, invariably with savings resulting from the simplification effected. Avail yourself of this service.



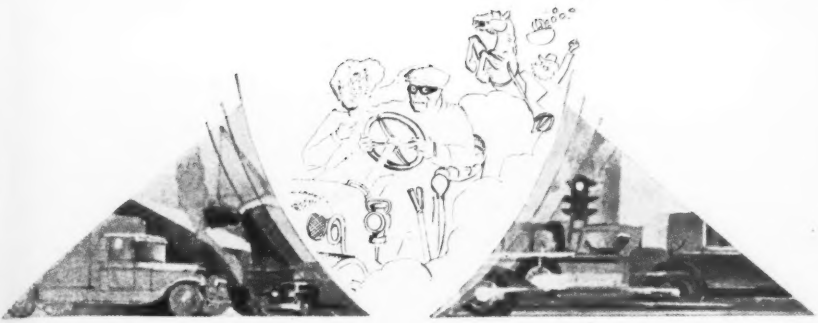
The S. S. WHITE Dental Mfg. Co., INDUSTRIAL DIVISION
150A WEST FORTY-SECOND STREET, NEW YORK

This illustration shows how the hundreds of special jigs, dies, and other tools used in the manufacture of small parts are stored at the plant of the Teletype Corporation, Chicago, Ill.

It is usually best to store the smaller size tools under the counter, thus placing the greatest possible number of items within easy reach of the window through which they will be given out. In the best of the more recently designed cribs, two or three horizontal rows of boxes and trays are built into the space directly under the counter. Among the tools stored in boxes and trays will be the small sizes of drills, reamers up to probably ¼ inch, taps, dies, and so on. The lower part of the space under the counter is generally divided into compartments or bins for tools, or fitted with boxes into which the returned tools may be placed.

The end sections of the racks nearest to the counter should be used to store those of the larger sizes of drills that are most frequently called for, such as, for instance, drills ranging in size from 17/32 inch to 1½ or 1¾ inch. For this purpose sloping shelves are used, with dividers which keep the tools separated and thus prevent them from becoming nicked by striking against each other. The dividers are adjustable. Immediately below the sloping shelves are flat shelves with dividers 1½ inches high for the storage of larger sizes of drills. An adjacent section should be arranged in the same manner for the storage of reamers.

Milling cutters, slitting saws, and similar tools which have holes through the centers are best stored by hanging them on pegs. For this purpose complete sections are now available, each consisting of a back panel to which are attached a pair of swinging doors, both the panel and the doors having holes located on one-inch centers in which the pegs may be ar-



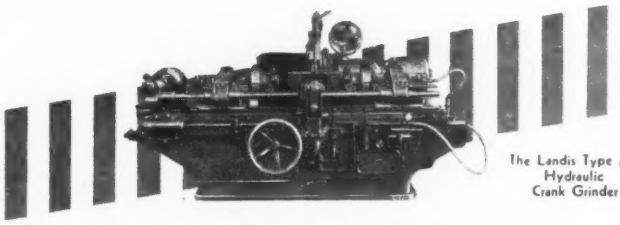
A Ghost From The Past

THE old gas buggy is many times referred to in a facetious manner. Nor without good reason. It is amusing to look at. It is, measured by our present day standards, highly inefficient. By no means is it adequate.

Progress in grinding machine design has been just as rapid and just as revolutionary as progress in automobile design. Yet there remain in use thousands of grinding machines which have long since passed their period of efficiency. Even though they may be in fair mechanical condition, they should not be used, just the same as an automobile of the vintage of 1916 or 1917 should not and would not be used even though it were in good mechanical condition.

Continued operation of obsolete grinders automatically causes their users to pay for modern new machines. This is true because the final selling price of any product is actually set by the competitor who makes the most of up-to-date methods and equipment.

Landis engineers are prepared to recommend grinding equipment to fit your needs. You are paying for it, why not have it?



The Landis Type AB Hydraulic Crank Grinder

LANDIS TOOL CO. (91)

WAYNESBORO PA

DETROIT·CHICAGO·NEWARK·PHILADELPHIA

ranged to best accommodate the various sizes of cutters. Pegs may be arranged on both sides of each door, thus materially adding to the capacity of the equipment.

Such small standard parts as bolts, nuts, cotter pins, rivets, washers, and similar parts may be dispensed from the toolcrib, in which case they are usually stored in adjustable compartment boxes, or in compartments, or bins in close proximity to the counter. The exact manner of handling such stock depends upon the quantity maintained. Tool sets or kits are kept either in compartments or in boxes, while the ends of the racks farthest from the counter are usually reserved for the storing of large wrenches, dogs, and other miscellaneous tools, of which there is always a quantity in the average toolcrib.

The toolcrib and its equipment are, as a rule, considered as necessary expense and not as production equipment, and too often is the toolcrib given scant attention beyond the building of a few rows of racks and bins. As time goes on and the tool inventory increases, extra bins are added here and there with the result that not only does the whole outfit become an ill-fitting, unhandy, and untidy conglomeration, but all that has been built is wasted and the place is thrown into utter confusion when necessity compels the rearrangement of tool storage facilities.

In the meantime, probably enough time has been lost by productive workmen in waiting at the toolcrib to have more than paid for first class storage equipment, had such equipment been installed in the first place. The toolcrib can waste or save money just as easily as any mechanic or machine in the shop, and the mechanic's time may be costing just as much while he is waiting for tools as it is when those tools are cutting.

Tantalum In the Process Industries

An announcement which should be of interest to the trade concerns the development, by the Fansteel Products Co., Inc., North Chicago, Ill., of a process of electro-fabricating Tantalum. Heretofore the use of Tantalum has been somewhat restricted because of the cost of the metal. By the new electro-fabricating process, however, pipe, tubing, and other parts are made from thin tantalum sheet by either covering or lining the tantalum shell with a deposit of copper for strength and rigidity. The copper may be deposited on either the inside or outside. A copy of the bulletin describing this service may be had without charge by addressing the company.

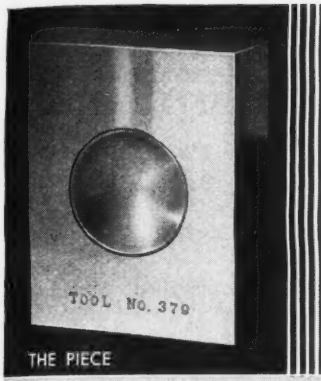
"Radiac" Cut-Off Machine and What It Will Do

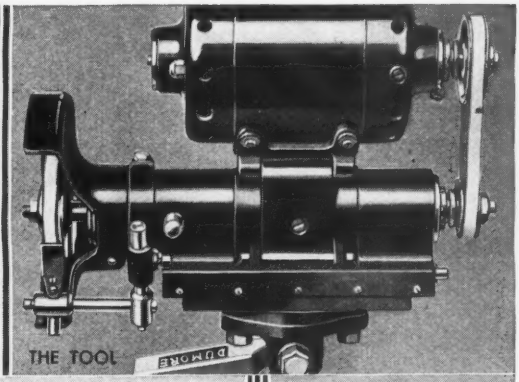
A 20-page book describing and illustrating the several sizes of "Radiac" Cut-Off Machine and discussing the various types of work for which this machine is especially adapted has been issued by A. P. de Sanno & Son, 1621 McKean St., Philadelphia, Penna. Illustrations are included showing different types and kinds of work upon which the machine is used, with full details as to the kind of material, size, kind of cut-off disc used, limits on dimensions of work, and production per hour. All information as to the operation and advantages of the machine are also given, with a list of users. Copy free upon request.

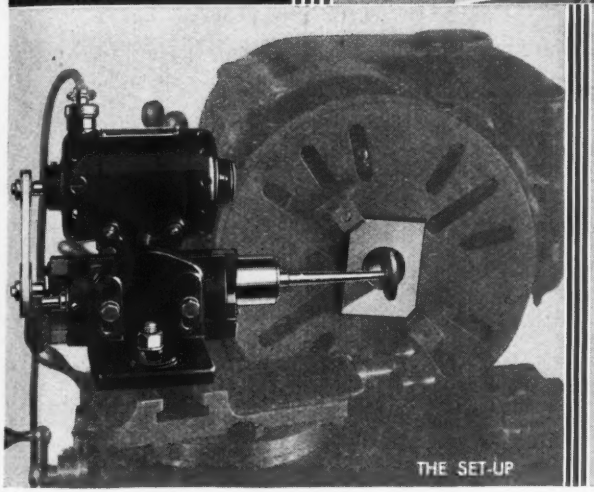
"A Saving at Every Turn"

The Link-Belt Company, Indianapolis, Ind., has issued an illustrated booklet, No. 1293, which describes the complete line of positive drives, including the Silent Chain, Roller Chain, Herringbone Gears, Herringbone Speed Reducers, Worm Gear Speed Reducers, Steel and Malleable Chains, and P. I. V. Gear (Positive, Infinitely Variable Speed Transmission.)

The text includes many illustrations of installations of these positive drive units, with descriptions of the installations and other information concerning the adaptability of the various drives to peculiar conditions. A copy of the book can be had, without charge, by any mechanical executive.







CORRECTING RADIUS *in a* FORMING DIE

Grinding of forming dies and tools is a common requirement in many industries. "Finish" grinding of such tools requires a high-speed precision grinder capable of accurate, vibration-free operation. The precision grinder must also be adaptable to a variety of set-ups and applications, since forming dies and tools come in a diversity of sizes and shapes.

The accuracy and adaptability of Dumore Grinders makes them indispensable for such service.

In the set-up illustrated a No. 3 Dumore is shown. While this is a comparatively simple set-up, two details besides performance of the grinder itself, are important. First, the grinding wheel must be absolutely centered; second, the wheel must be of just the correct size to assure proper radius in the tool.

SEND FOR THIS MANUAL ... ON PRECISION GRINDING

. . . . an authoritative technical treatise on precision grinding. A valuable reference work profusely illustrated.

THE DUMORE COMPANY
28 Sixteenth Street, Racine, Wisconsin
Send me a copy of "Precision Grinding".

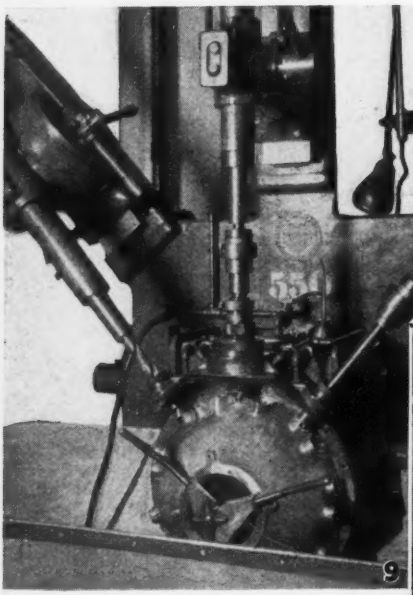
Name.....
Address.....
Company.....
City.....State.....

TRADE MARK
DUMORE HIGH-SPEED **GRINDERS**
REG. U. S. PAT. OFFICE

Machining Parts For "Wasp" and "Hornet" Engines, II

By HOWARD CAMPBELL

THE nose section of the crankcase for the direct-drive "Wasp" engine is an aluminum forging. This section carries the valve tappet guides and incloses the cam by which the cam roller followers are actuated to operate the valve-rockers. There are 18 tappet guide holes and 9 guide seats, which are drilled, faced, and reamed with the equipment shown in Fig. 9. This machine is a special three-spindle drill, and the jig is of the common index type with a bushing plate carrying the bushing.



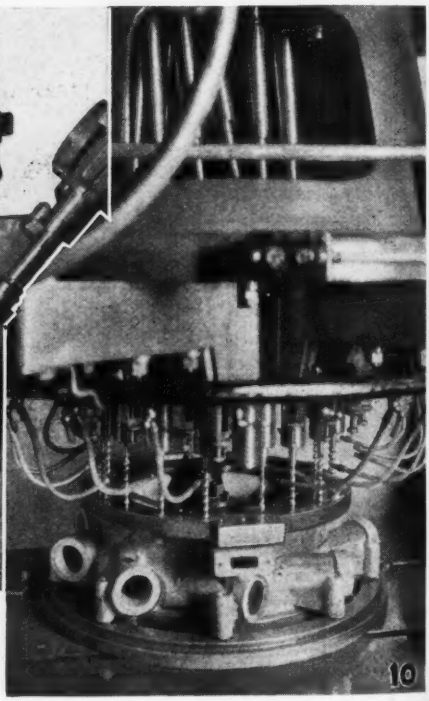


Fig. 9—The 18 tappet guide holes are drilled and reamed and the tappet guide seats are faced with this equipment. Fig. 10—Drilling seventeen $\frac{13}{32}$-in. holes and one $\frac{5}{16}$-in. dowel hole. Note the "quick spiral" drills.

The left-hand spindle of the machine carries a 31/32-in. drill, with

. . . . . Use this

"Standard Gage"

COMPARATOR
MODEL No. 105

On Your . . . . . .
Precision Work

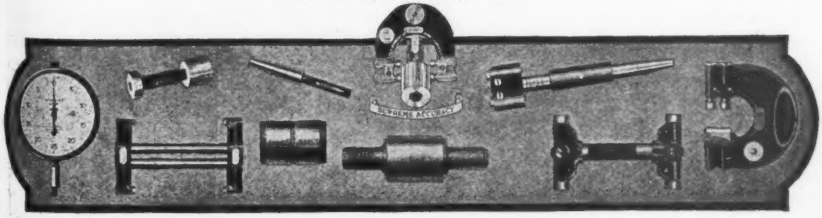
IT IS the ideal comparator for all shops . . . built for production inspection, incorporating the finest in accuracy to meet the most exacting requirements.

The "Standard Gage" Comparator Model 105 is distinctive in design, rugged and durable in construction to insure a long life of efficient service. It is furnished with either the Model No. 2-X special indicator which gives readings in .0001" (.00005" can be estimated with ease) or with the Model X-2-X indicator which gives readings in .00005".

The many advantages, details of construction, and specifications of the New Model 105 are listed in a special bulletin. Send for it . . . study it . . . see how this new comparator will fit into your production and final inspection departments.

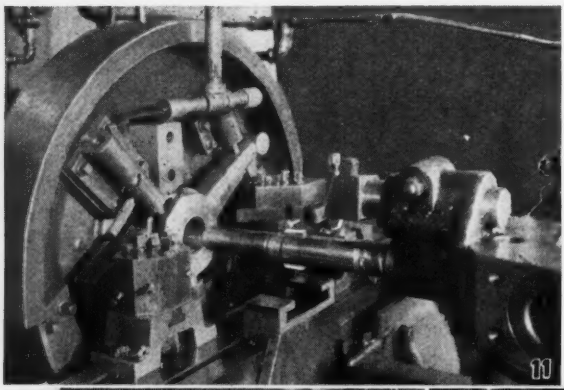
SEND FOR CATALOG

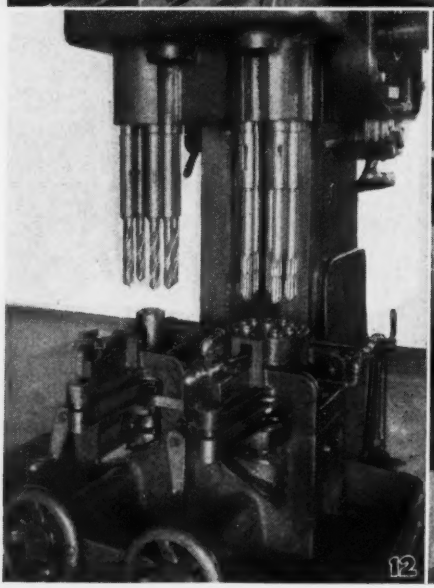
STANDARD GAGE CO.
INCORPORATED
POUGHKEEPSIE, N. Y.



which the first operation is performed on each hole. The right-hand spindle carries a 1-in. reamer with which the holes are finished to size within a tolerance of 0.0005 in. While these operations are in process, the tool carried by the center spindle is facing the tappet guide seat, which is located between each pair of guide holes. The holes and seats on an entire case are finished in 50 minutes.

In Fig. 10 a blower section is shown set up on a Natco multiple-spindle drill to have the holes drilled by which this section is bolted to the main case and rear section. In this operation seventeen 13/32-in. holes and one 5/16-in. hole are drilled, the latter being a dowel pin hole for locating the parts exactly. The 13/32-in. drills are of the "quick-spiral" type, which is said to cut more freely in aluminum than the usual type of twist drill. The jig locates by pins in a bottom plate, which is anchored to the table of the machine, so that





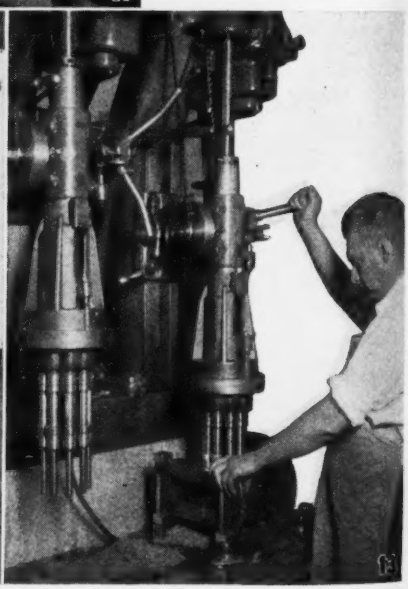
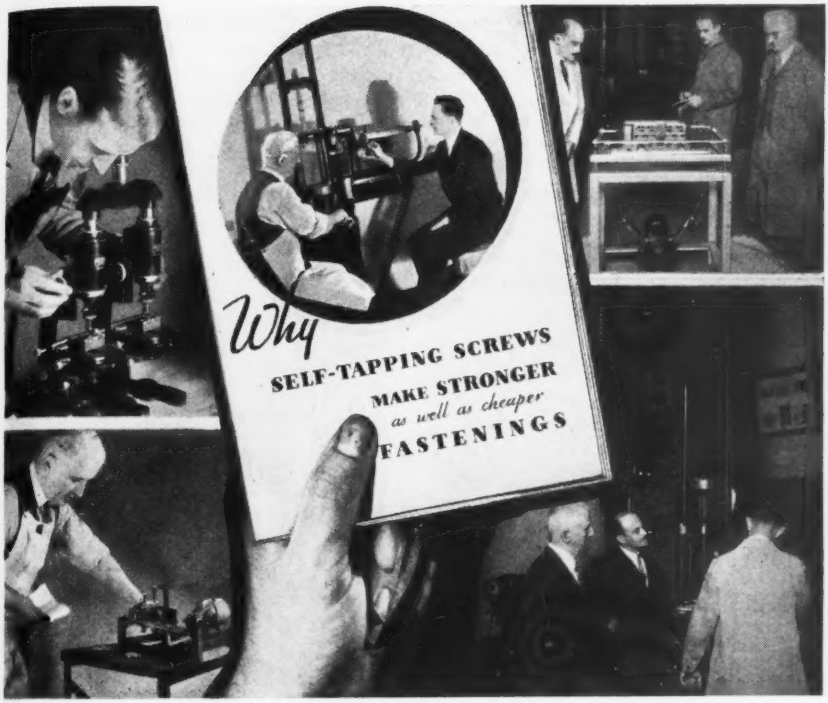


Fig. 11—The master rod forging is bored and faced in an automatic lathe. Fig. 12—Here the knuckle pin holes in the master rods are drilled and rough reamed. There are eight drills in the head at the left. Fig. 13—The knuckle pin holes are rough and finish reamed with this two-spindle Barnes drill. They are ground after reaming.



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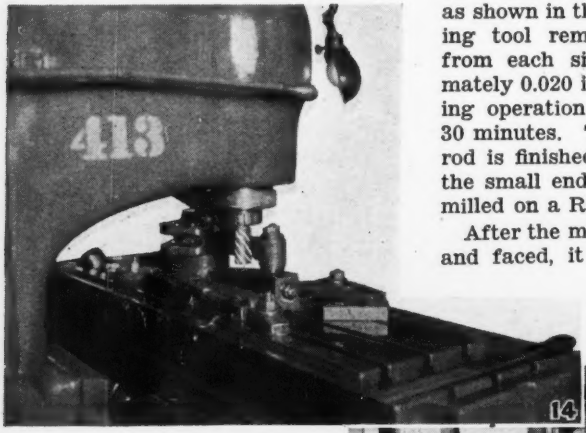
when the bushing plate is in place, it will be properly aligned with the drills.

After the main section holes have been drilled, the piece is passed to a second Natco, where sixteen F-size holes are drilled in the opposite side.



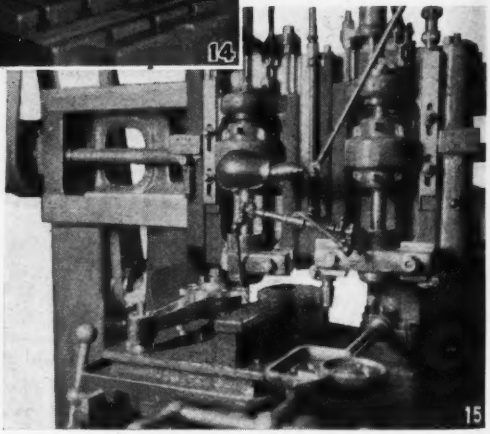


Fig. 14—Machining the straight sides of the master rod. The small end of the rod can be shifted to give the rod the necessary taper. Fig. 15—The large end of the master rod is finished to size and shape by profiling in this machine.

These holes are tapped out for the bolts by which this section is held to the rear section. The section is then passed to a third Natco, where nine 29/64-in. holes are drilled for bolting the section to the motor.

The master rod for each of the Pratt & Whitney engines is of one-piece construction, machined to an I-section. One of the first operations on the master rod is that of boring and facing the rod, which is performed in an automatic lathe as shown in Fig. 11. The rod is located by means of a bayonet-lock plunger, and is held by a Logan air-chuck. Approximately ¼-in. of stock is removed from the face of the rod, the facing being done by tools held in the cross-slide of the machine. The crankshaft bearing hole in the rod has previously been rough-drilled so that the boring tool can enter. This tool and the tool which turns the collar are held in the turret, as shown in the illustration. The boring tool removes 3/16 in. of stock from each side and leaves approximately 0.020 in. of stock for the grinding operation. This operation takes 30 minutes. The opposite side of the rod is finished on a boring mill, and the small end of the rod is straddle-milled on a Rigidmil.

After the master rod has been bored and faced, it is clamped in the jig shown at the left in Fig. 12 and the eight knuckle pin holes are drilled. The rod is then shifted over to the jig at the right, and the holes are rough reamed. In each jig the rod is located from the crankshaft and wristpin bearing holes, and is clamped by being raised against the under side of the bushing-plate. The clamping mechanism is operated by the hand-wheel which projects from the front of the jig.

(*Continued on page 39*)

Machining Parts For Engines

(Continued from page 36)

The knuckle pin holes are rough and finish reamed, in the next operation, with the tools shown in use in Fig 13. The machine is a combination Barnes drill, having two spindles and one table. Each spindle is equipped with a multiple head with eight spindles.

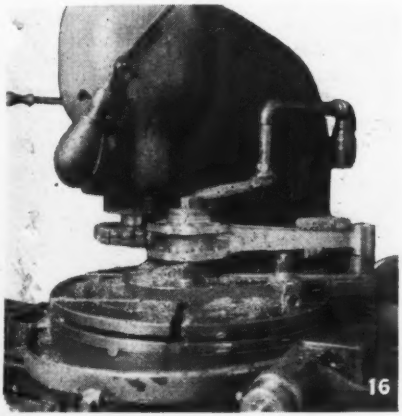


Fig. 16—Milling clearance for the link pins.

The roughing reamers, in the head at the left, each have six blades and each of the finishing reamers, at the right, has 10 blades. Each reamer has its own bushing, which is inserted into the bushing plate when the reamers are inserted in the holes and removed by the reamer when the reamers are withdrawn. The bushings can be seen on the reamers at the left. The roughing reamers enlarge the holes to 1.033 in., and the finishing reamers finish them to 1.044 in., leaving 0.015 in. for finishing grinding.

The sides of the master rod are finished on the Milwaukee milling machine shown in operation in Fig. 14. The rod is located and held by a pin at either end, the pin that fits into the wristpin hole being adjustable so that it can be shifted sideways in order to allow a straight cut to be taken on either side of the rod, at the same time giving the rod the necessary taper. A spiral cutter is used, and approximately ⅛ in. of stock is removed from each side, leaving 0.005 in. for polishing.

Shape is given to the large end of the rod by profiling it in the machine shown in operation in Fig. 4. As in most profiling operations on production work, the movement of the cutter is governed by the movement of a stylus in following the outline of a master plate. Thus the exact outline desired is obtained, the accuracy of the operation being governed by the accuracy of the master plate.

In Fig. 16 is shown the operation of milling out the stock to provide clearance for the link pins. Here again a Milwaukee vertical miller is used, with a pair of interlocking cutters of the desired shape. The rod is located by means of pins at either end and is bolted to a rotary table which is set so that the center of the large end of the rod is in the exact center of the table. The horizontal table is then fed over until the cutters are in the piece to the correct depth, then the horizontal table is clamped in place and the rotary table is started revolving. This operation is completed in sixty minutes.

(The third and concluding section of this article will be published in the July issue.)

Film Shows Use of Tungsten Carbide

"Milling With Tungsten Carbide," is the title of a moving picture that has been produced by Kearney & Trecker Corporation, Milwaukee, Wis., to illustrate the application of tungsten carbide and tantalum carbide cutters for milling various types of products. The subtitles give the speeds and feeds used for each of the operations shown, as well as the cutting time per piece. The film can be obtained by any responsible organization for showing before engineering societies, executives' meetings, foremen's groups, and so on. The film is available in either 16 or 35 mm sizes.

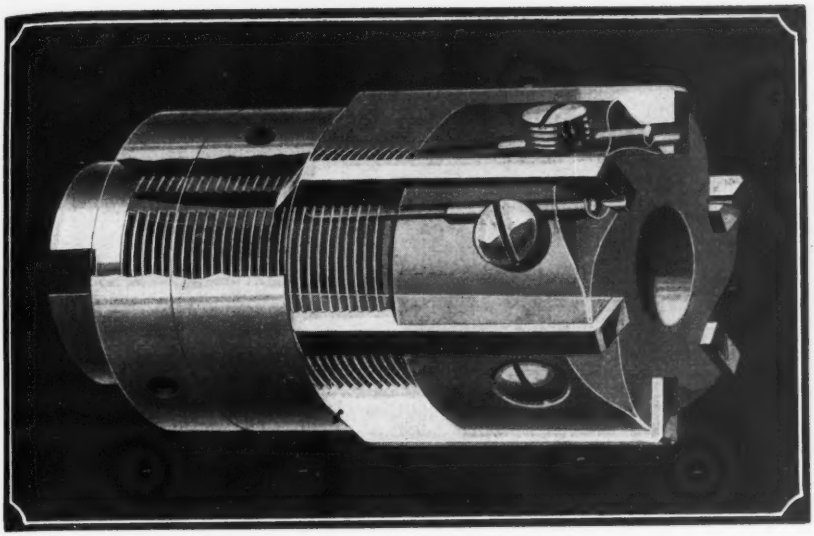
Measuring Screw Threads By the Use of Wires

By H. L. VAN KEUREN
President, The Van Keuren Co., Boston, Mass.

THE cutting of a screw thread is a simple matter, but the accurate measurement of that thread is not always so simple. The last decade has witnessed many improvements in tools and instruments for use in determining the accuracy of screw threads, among which are male and female thread gages, optical projectors of thread forms, and thread-measuring wires. Optical projectors aid in the production of perfect male thread gages, but such instruments are most useful for checking the form and angle of thread. Male thread gages can be made practically perfect, and female thread gages, as made by the best gage manufacturers, are very nearly so. Such gages are usually purchased in standard sizes, and are unquestionably the simplest to handle on high production work. However, the accuracy or wear limit of male thread gages and set plugs for ring gages must be verified, for which accurate measuring wires are a necessity. Also, it frequently happens that special thread gages must be made up, or that screws of odd size or pitch must be cut, in which case the standard gages are of no use. At such times the only practical method of determining the accuracy of the thread is by the use of wires that have been especially made for the purpose.

Fig. 1—Measuring the pitch diameter of a ground thread tap with Van Keuren "Best Size" wires.

The three-wire method of measuring screw threads has been in use for a number of years. Originally the wires used were odd pieces of soft drill rod, sewing needles, or perhaps shanks of small drills. As the measurements secured depended often on wires that were neither round nor of uniform diameters, and as the inaccuracies are multiplied by three in the computation of the pitch diameter, very doubtful results were obtained. Now, however, wires can be obtained that are accurately made, hardened, ground, and lapped. The status of the three-wire method of measuring screw threads is indicated by a paragraph on page 184 of the Report of the National Screw Thread Commission, 1928 revision, which states "The so-called three-wire method of measuring pitch diameter, as here outlined, has been found to be the



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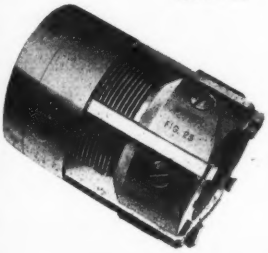

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most accurate and satisfactory when carried out properly, and is recommended for universal use in direct measurement of thread plug gages."

In measuring a screw thread, the only way an accurate measurement can be obtained is by measuring the screw through the body of the thread —not over the top of the thread where a bur may interfere or where an accurate diametrical measurement can be obtained regardless of the fact that the thread may be too shallow or too deep. An accurate measurement can be obtained through the body of any thread by the use of a micrometer and three wires, the wires to be of the same diameter and within certain limits for size, the best wires being of a diameter that will allow the wire to rest on the sloping sides of the thread midway on the slope, or at the point where the land and space are of equal dimensions. Wires which meet these specifications are recommended by the National Bureau of Standards and the National Screw Thread Commission. These wires will give correct pitch diameter measurements even when errors are present in the angle of the thread.

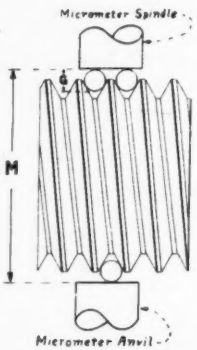

Fig. 2—Principle of thread pitch measurement by three-wire system.

The screw or gage to be measured is usually held between centers or in a small vise, and two wires are laid in the grooves of two adjacent threads, where they are held by the spindle of the micrometer while a third wire is slipped into position on the opposite side of the piece. Then a measurement is taken over the three wires as shown in Fig. 1. A reading is taken from the micrometer and a simple computation gives the actual pitch diameter of the screw. As the correct pitch diameter of any screw is equal to the diameter of the screw minus the depth of one thread, the actual pitch diameter may easily be compared with the correct pitch diameter.

The general formula for computing the pitch diameter of any symmetrical screw thread is:

$$PD = M + \frac{\text{Cot } a}{2N} - (1 + \text{Cosec } a)$$

Where

PD = Pitch Diameter
a = Half angle of thread
N = Number of threads per inch
M = Measurement over wires
G = Diameter of wires

For 60-degree threads, this formula reduces to

$$PD = M + \frac{0.86603}{N} - 3G$$

In the above formula the term $\frac{0.8663}{N} - 3G$ may be computed once and for all and called the wire constant. This constant changes only with the number of threads per inch, or with the angle of the thread. Thus the formula becomes

PD = M — Wire Constant.

As an example, let us consider the tap that is shown in process of being measured in Fig. 1. This is a ½-in. 20-thd. ground tap. The size of the wire to use for 20 threads per inch is 0.02887, and the wire constant is 0.04331. The micrometer reading is 0.5109, thus the example becomes PD = 0.51090 — 0.04331 = 0.46759 in. The depth of a 20-pitch thread is 0.03248, therefore the correct pitch diameter of the tap is

0.500 — 0.03248 = 0.46752 in.

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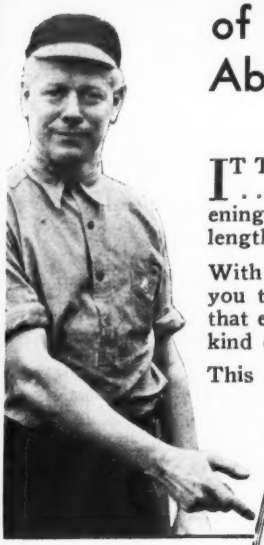

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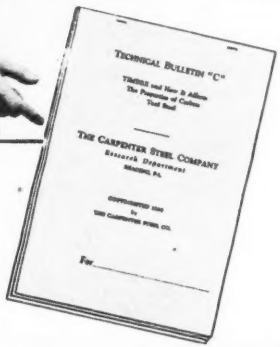
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Thus the tap is shown to be 0.00007 in. oversize on the pitch diameter.

Checking Angle of Thread

When an optical projection apparatus is not available, the thread angle can be determined by the use of wires, although it is necessary to use two sets of wires of different sizes. The three-wire method of measuring the thread angle of a U.S.S. thread is indicated in Fig. 3. The formula is

$$\frac{M1 - M2}{G1 - G2} - 1 = \text{Cosecant of } \tfrac{1}{2} \text{ angle}$$

Where

M1 = Measurement over large wires
M2 = Measurement over small wires
G1 = Diameter of large wires
G2 = Diameter of small wires

Thus, as an example, the thread angle of a ¾-in. 10 U.S.S. thread is found as follows:

M1 = Measurement over large wires = 0.89497
M2 = Measurement over small wires = 0.76378
G1 = Diameter of large wires = 0.09622
G2 = Diameter of small wires = 0.05249

$$\frac{0.89497 - 0.76378}{0.09622 - 0.05249} = \frac{0.13119}{0.04373} =$$

$$3 - 1 = 2.0000$$

As 2.0000 is the cosecant of the angle of 30 deg., the thread angle is 60 degrees. For 60-degree threads the following data will be found convenient:

$$\frac{M1 - M2}{G1 - G2} = 3.0000$$

if the angle is 60 degrees.

For other angles, the following results will be obtained:

Result	Angle
3.0152	59 deg. 30 min.
3.0101	59 deg. 40 min.
3.0050	59 deg. 50 min.
3.0000	60 deg.
2.9950	60 deg. 10 min.
2.9900	60 deg. 20 min.
2.9850	60 deg. 30 min.

The pitch diameter of a taper thread can be determined by the use of the wires, although it is also necessary to have a height gage or set of gage blocks. A point is selected on the taper thread, usually corresponding to the gaging point or point where the pitch diameter is specified on the drawing. This point is marked by rubbing Prussian blue on the adjacent side of the next thread, and one wire is inserted. Two wires are placed in the angles of the opposite threads and a micrometer reading is taken over the wires. Inasmuch as the micrometer will be set in an angular position, the angle must be corrected. For American National Standard Pipe Threads, the correction is made by multiplying M by 1.00048, and the formula becomes

PD = 1.00048M = Wire Constant

Specifications For Wires

The following specifications for thread-measuring wires are taken from the report of the National Screw Thread Commission:

1. The wires should be cylinders of steel with working surfaces glass-hard and accurately finished.

2. A suitable container should be provided for each set of wires, and if wires are furnished without handles, the pitch for which the wires are the best size and the diameter of the working part of the wires should be marked on the container.

3. The wire should be round within 0.00002 in., and should be straight to 0.00002 over any ¼-in. interval.

4. One set of wires should consist

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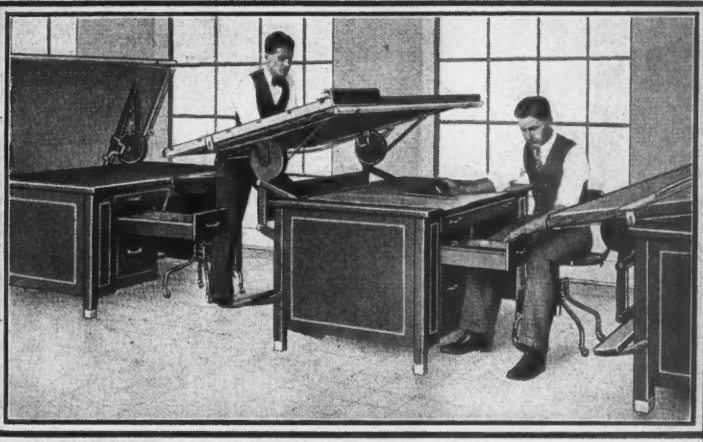

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of three wires which should have the same diameter within 0.00003 in. and this common diameter should be within 0.0001 in. of that corresponding to the best size for which the wire is to be used.

The foregoing specifications show that wires for measuring screw threads must be of the highest degree of accuracy. Wires especially made for this purpose are now available in the market, put up in glass bottles with aluminum screw caps, each bottle labeled with the size of wire, wire constant for the particular size of thread to be measured, and the number of threads for which the wires are to be used. Such a set of measuring wires is shown in Fig. 4. This assortment includes all standard sizes of wires from 6 to 36 pitch and covers all requirements for the average shop. This set does not include wires for very fine and very coarse threads, nor wires for measuring Acme or 29-deg. worm threads.

No computations are necessary in using these wires. The workman takes his measurement over the wires as instructed, and subtracts the wire constant given on the label in order to obtain his pitch diameter. Such equipment is an essential part of the inspection equipment in any shop where odd-size threads are cut, where gages are made or used, where thread accuracy is important, or where ground-thread taps are used.

No. Thds. per Inch	$G = \frac{.57735}{N}$ Dia. Best Wire	$H = \frac{.86602}{N}$ Depth V Thd.	$h = \frac{.64951}{N}$ Depth US. Thd.	$N = \frac{\text{No. Thds. Per Inch}}{\text{Min. Wire}}$	Max. Wire
80	.00722	.01083	.00812	80	50
72	.00802	.01203	.00902	72	44
64	.00902	.01353	.01014	64	40
56	.01031	.01546	.01160	56	36
50	.01155	.01732	.01299	50	32
48	.01203	.01804	.01353	50	28
44	.01312	.01968	.01476	50	26
40	.01443	.02165	.01624	44	24
36	.01604	.02406	.01804	40	22
32	.01804	.02706	.02030	36	20
30	01924	.02887	.02161	32	19
28	.02062	.03093	.02319	30	18
26	.02221	.03331	.02498	28	16
24	.02406	.03608	.02706	26	16
22	.02624	.03936	.02952	24	14
20	.02887	.04330	.03248	22	13
19	.03039	.04558	.03418	20	12
18	.03207	.04811	.03608	20	11½
16	.03608	.05413	.04060	18	10
14	.04124	.06186	.04640	14	9
13	.04441	.06662	.04996	14	9
12	.04811	.07217	.05413	13	8
11½	.05020	.07531	.05648	12	8
11	.05249	.07873	.05904	11½	7
10	.05774	.08660	.06495	11	6
9	.06415	.09622	.07218	10	6
8	.07217	.10825	.08119	9	5½
7	.08248	.12372	.09279	8	4½
6	.09622	.14434	.10825	6	4
5½	.10497	.15746	.11805	6	4
5	.11547	.17320	.12990	5½	4
4½	.12830	.19245	.14434	5	4
4	.14434	.21651	.16238	4½	

Note:—Sometimes taps have an outside diameter over basic, and the minimum wires given may not project above the tops of the thread.

Table for use in selecting Van Keuren "Best Size" Wires

Fig. 4—Set of Van Keuren "Best Size" thread-measuring wires.

Kellocater Jig-Boring Machine

A booklet describing the "Kellocater" jig-boring machine and enumerating its advantages has been issued by Keller Mechanical Engineering Corp., 84 Front Street, Brooklyn, N. Y. The book contains twelve 8½ x 11-in. pages, all of which are devoted to descriptions and illustrations of the various parts of the machine. A list of the features and table of specifications are printed on the last page. Copy free upon request.

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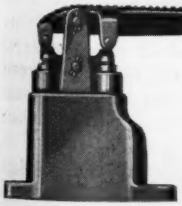

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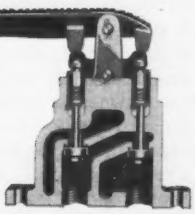


Scrap

By ELLSWORTH E. CLARK

JIM HANDS tamped the tobacco into the bowl of his old pipe with his little finger. This action was only a gesture, as, while the bowl of the pipe was big, the finger was massive. So were all the rest of Jim's thumbs and fingers; they were not unlike the peen of a five-pound hammer. And his hands—they resembled small hams.

You knew at once why he was called "Jim Hands." He was on the payroll as "Jim Hands," and that was the name by which he has been known on other payrolls, for Jim was a drifter—one of those who used to be known in the old days as a "boomer." It may be that that was the principal reason why Jim was such a good toolmaker.

That Jim possessed a skill that could only be acquired through a wide and varied experience there could be no doubt. One had only to watch him on a fitting job; there was something uncanny about the way the big thumb and forefinger would pick up a 6-32 screw from the bench plate and start it. You saw the move for the screw—saw it vanish only to reappear well started in the tapped hole. It reminded you of a vacuum sweeper.

While Jim was admittedly the best toolmaker in the shop, he never seemed to know it. When the "drifting" fever got him and he left, money was never mentioned, and when he returned he never knew his rate nor asked it until he had his first pay envelope. What Jim's real name was no one knew and no one cared, least of all Jim himself. When he could be induced to talk—which was not often—his yarns were worth listening to, and always they carried the earmarks of truth.

It was late October. Jim had come back to us with the first frost, and we felt sure that we would have one good toolmaker with us until, at least, March. There were six or seven of us sunning ourselves on the casting platform back of the shop during the noon hour, smoking and idly watching Ikey Marz, the local junk dealer, and his boy untangling strip steel scrap from the pile, bending it together and tossing it into Ikey's dilapidated wagon.

"This place needs a baler," some one remarked. "Seen one last summer that bales that stuff just like hay."

"What do they cost?" asked Slim Kovic. No one ventured a reply and the subject seemed just about to be dropped when Jim Hands said, thoughtfully, "Scotty McMillen didn't need a baler; he had an idee."

"How was that, Jim?" I asked, and waited. I knew better than to try to rush Jim.

"Scotty owned a little punch shop over in Rockymore," said Jim, finally, "'Bout ten or twelve presses he had, I guess; made dies, made punchin's, done a little copper, nickel and brass plating, but put in most of his time borrowin' money fer the payroll. Good feller to work fer, tho', Scotty was; hard as Hell, but had to be to make out with that shop he had. Old Swede Bremer was his foreman. Swede was a big booze bum, and I never could see why Scotty kept him around. One day, Swede got hold of some squirrel whiskey, and the red, blue and green lizards chased him into the mill pond. Anyhow, Swede was a goner when they fished him out.

"The Swede's sister up in Chicago sent Scotty forty dollars—all she had—and asked Scotty to give Swede a

Steel Storage Cabinets

No. 18 Single Tier CABINET

Consists of one tier of drawers, 18 drawers total, each drawer of inside measure 10" wide x 15" deep x 3" high. Combination brass pull and label holder. Cabinet stands 69½" high x 12" wide x 16" deep. Mounted on swivel casters. Finished olive green lacquer. Fully set up.

No. 36 Double Tier CABINET
(Illustrated)

Our most popular selling Cabinet for use in either office or shop. 36 drawers total, 10" wide x 15" deep x 3" high. Overall: 69½" high x 24" wide x 16" deep. Mounted on swivel casters, olive green lacquer finish. Fully set up.

No. 54 3-Tier CABINET

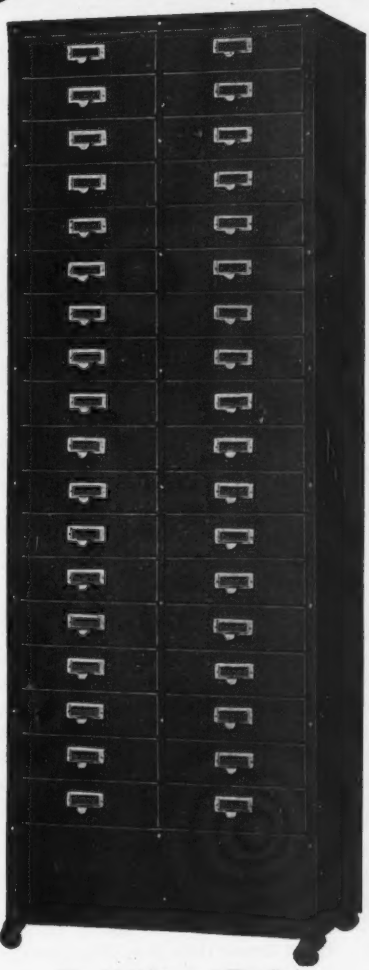
A combination of No. 18 and No. 36 Cabinets, consisting of three tiers of drawers in one complete Cabinet. Overall size: 69½" high x 35½" wide x 16" deep. Mounted on casters, finished green lacquer. Fully set up.

No. 72 4-Tier CABINET

A combination of two No. 36 Cabinets, consisting of 4 tiers of drawers, 18 drawers to a tier built as one complete unit Cabinet. Overall: 69½" high x 48" wide x 16" deep. Finished olive green lacquer; fully set up.

Also

SHOP DESKS
MACHINE TENDERS
BENCHES
STOOLS, ETC.



No. 36 Cabinet—2-Tier Style
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Write for complete catalog and prices. We have over 20 stock patterns of steel cabinets or will build special to suit your ideas.

ANGLE STEEL STOOL CO.

PLAINWELL, MICHIGAN

Christian burial, but you know that wouldn't plant a Chinaman, so Scotty and us fellers talked it over, and said what a good mechanic the Swede was —once—and that it would be a shame to let the town bury him. So it wound up by us all chippin' in about four dollars apiece from next payday, so we could give the Swede a first-rate send off. It's about the use of the church we got along with the preacher we hired that I want to tell you; sort of throwed the church in, you might say.

"Most of the fellers wasn't regular church-goers — kinda nervous and clumsy. I don't b'lieve Scotty had been in a church in ten years; I know I hadn't. Red Riley fergot to ditch his cud of Five Brothers before he went in and, of course, he had to swallow it. Slab Wilson that run the big planer got to foolin' with a sort of book-rack that was on the back of the seat in front of us and got his finger fast. I was on one side of him and Scotty on the other, and we, of course, was watchin' him get loose.

"That book-holder was made from sheet steel about a thirty-second thick, with holes and curley-cue designs punched in it—that is, the three sides was—and the thing was about three inches deep and a foot long. It was only about as wide as the book was thick, and I recollect the bottom was wood. After Slab got his finger loose I never give it another thought. Work was kinda slack, and Scotty made some collections or borrowed some money and paid us, and I drifted."

I was sure there was more to the story, but I knew that Jim was always fearful that his listeners might discredit him—Jim was a modest soul—so I said "Come clean, Jim; what's the sequel?"

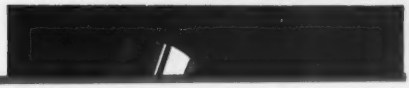
"There wasn't nothing like that," said Jim, "But the next time I drifted into Rockymore, about a year later it was, I guess, I headed for Scotty's dump, of course, and when I rounded the corner where Scotty's old frame shack would be, there stood a fine big brick two-story factory with a glass office, bookkeepers, female typewriters, and clerks, and the whole works was just hummin'.

"I was wondering what had become of Scotty and had started back to the trolley stop when I heard Scotty callin' me. There he was with his head stickin' out of one of the windows of that fine office, and when I walked back toward the window he says, 'Jim Hands—you old tramp—what do you mean by walkin' away like that?' and the way he grabbed me and dragged me into his own office, back of the big one, you'd a thought he was goin' to kiss me. And then he told me all about it.

"Seems like it was that day we was at the Swede's funeral and watched Slab tryin' to get his finger out of the book-holder that it started. I thought it was just funny, but Scotty thought of it as an idee, and when he explained it to me it was so simple it made me feel as dumb as an ox. His idee was just to use sheet metal punchin' scrap to make them book-racks. He had tons of sheet scrap out in the shed that he couldn't give away—all kinds, thicknesses, and designs from the plain washer scrap to the fancy curley-cue kind like we seen that day on that book-rack. So Scotty started makin' church seat book-racks, and flower pot fern holders, and card trays, and a lot of other things like that, all finished in plated and japanned finishes.

"There was brass, and nickel, and copper with dark and bright spots; purty things they was. Round, square, long, narrow, whatever depth the strip scrap happened to be — and he sold these things he made from that scrap, mind you, sold 'em to stores for cash

(*Continued on page* 102)



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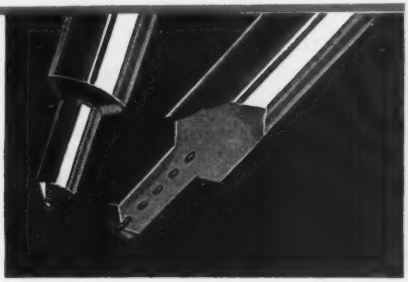
to Give You a Better DIAMOND DRESSER!



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The illustration shows the small diamonds mounted in line.

SELECTING an industrial diamond by "looks" . . . guessing at its quality . . . is an expensive proposition. Especially so, since KOEBEL Multi-Set Diamond Dressers offer you diamond tools of **Standardized** size, quality, cutting characteristics and price . . . by the simple method of specifying a catalog number.

The KOEBEL Multi-Set Diamond Dresser is a new idea in the way of diamond dressers. Instead of using one stone which must be remounted time and time again, this diamond dresser has several small, tested, quality diamonds mounted in one tool. As soon as the first diamond is used up by wear, the metal is ground away to expose the next stone. And, the KOEBEL method of mounting, protects each diamond against loss until it is completely used up.

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Multi-Set Diamond Dressers

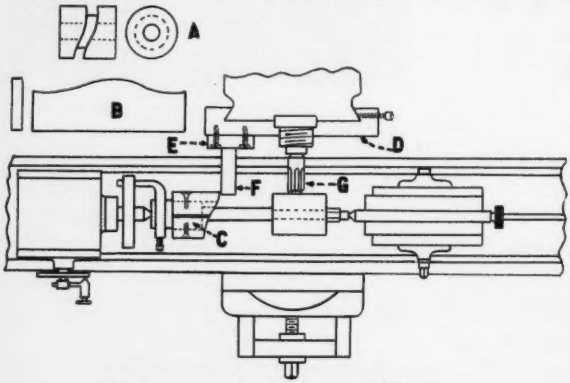
Ideas From Readers

This department is a clearing house for ideas. If there is a "kink" or short cut in use in your shop, send in a description of it. We will pay $5 for each one published.

Making a Special Cam

By CHARLES KUGLER

THE illustration shows the equipment that was used to make a special cam that was needed in our shop in a hurry. The general design



Equipment used to make a special cam.

of the cam is shown at **A**, and at **B** is shown a plan view of the cam as it was laid out on a sheet of ⅛-in. stamping steel. After the design on the sheet had been cut out and filed to the layout lines, it was coiled to form a cylinder and attached to the arbor **C**. This is a quick method of making a master cam.

To the column of a milling machine was clamped a bracket **D**, to which was attached the plate **E**, carrying the former pin **F**. The former pin was the same diameter as the end mill that was used to mill the cam. The master cam had to be adjusted on the arbor so that when it was in contact with the former pin, the mill was properly located to mill the slot at the desired position on the work-piece. The milling machine screw was then disengaged from the table, and a cable was attached to the table in such manner that it could be passed over a pulley and a weight attached to the end. The weight kept the master cam in contact with the former pin as the arbor revolved. The arbor and work were revolved by turning the crank of the index head.

In performing this operation in the manner shown, it is necessary that the center line of the arbor and the machine spindle be in the same plane. It is well to use a small end mill to rough out the cam-groove before finishing. If the cam is properly laid out on the steel sheet, a satisfactory job can be obtained.

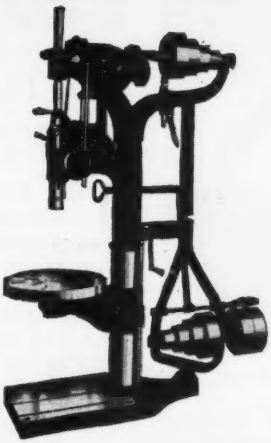
Clamps For The Railroad Shop

By JOHN MCCULLAGH

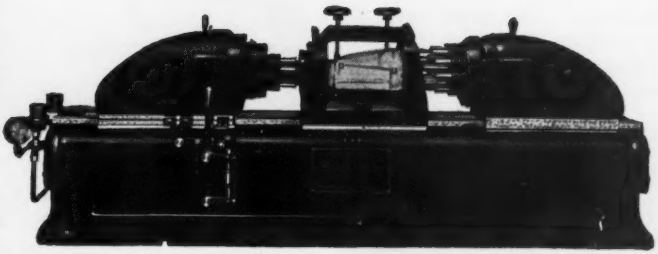
THE illustrations show two clamping devices that are used in connection with the transportation of locomotive units in a western railroad shop. These devices are suited to the handling of work having flanges, and can grip from the outside or inside.

STANDARD & SPECIAL DRILLING & BORING MACHINES

A complete line of standard upright drilling machines—single spindle and gangs—stationary and sliding head—belt and motor drive—with or without attachments.



At left is shown 25-inch Stationary Head Drill, with Power Feed, Automatic Stop and Back Gears, arranged for belt drive.



Special single-spindle or multiple spindle machines, working from one direction or several directions simultaneously, with or without indexing table; for high production and heavy duty drilling, boring, reaming and similar operations.

Horizontal Duplex Heavy-Duty Drilling and reaming machine illustrated above.

Write for booklet entitled "Performance."

A SERVICE WHICH GIVES HIGH PRODUCTION WITH LOW MAINTENANCE *by*

W. F. and John Barnes Co.

ROCKFORD, ILLINOIS

Established 1872

The clamp shown in Fig. 1, which is gripping a driving box that is just about to be raised, is made of steel

Fig. 1—Clamp used in lifting driving boxes.

brackets, ½ x 1½ in. in size, as shown. The clamps are formed as shown and are provided with jaws at the ends of the brackets. The jaws were attached by welding. In Fig. 2 is shown a clamp that is used in picking up work that is gripped from the inside

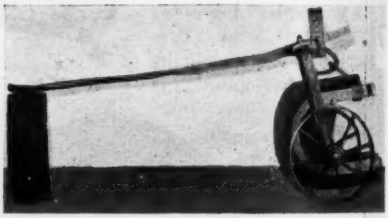
Fig. 2—This clamp grips the piece from the inside, the jaws expanding as the eye is raised.

surface. In this case the eye is attached to a toggle joint, which causes the jaws to expand when the eye is raised. The design is such that a firm grip is obtained on the work. These clamps are comparatively inexpensive to make and will save their cost in a short time in the handling of materials about the shop.

A Handy Locomotive Driving Box Wagon

By H. H. HENSON

THE illustration shows a device that has proved valuable for transporting locomotive driving boxes from the machine shop to the drop pit, or to the brass foundry to have hub liners applied. With this "wagon," one man can easily move the heaviest driving box. The wagon consists pri-



Locomotive Driving Box Wagon.

marily of a forked axle with two steel wheels, mounted on roller bearings, and attached to a steel forged tongue. An important feature of the device is the piece from which the box is suspended. The piece is pinned to the rear end of the tongue by a pin through one of a series of holes. The holes make it possible to adjust the piece to any height necessary to accommodate the various sizes of boxes.

In order to pick up a box, the tongue is raised, thus lowering the rear end of the tongue so that the box can be coupled on. As the tongue is pulled downward, the rear end of the tongue is raised, lifting the box

(*Continued on page 59*)

Ideas From Readers

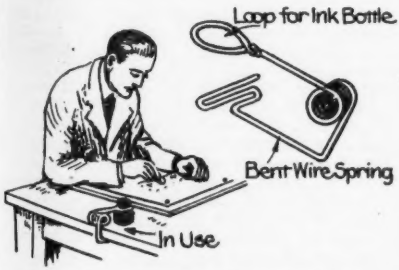
(Continued from page 54)

clear of the floor. The wagon is very useful even where crane service is available. The cost of making the wagon is negligible compared to the cost of the time and labor that is saved by the use of it.

Bent Wire Clamp For Ink Bottle

By MORRIS A. HALL

MANY methods have been devised to hold the draftsman's ink bottle so that it cannot be tipped over, but probably none serves the purpose better than the clamp shown in the illustration. This clamp is made of spring wire, coiled to form a spring at the center, looped at one end to fit over the neck of the bottle, and bent at the other end to form a pressure pad, as shown. The pad is slipped under the table and the neck of the



Wire Clamp Holds Ink Bottle In Position

bottle is inserted through the loop so that the pressure exerted by the spring will hold the bottle firmly in position. The amount of tension developed by the spring depends on the size and kind of wire used, but the clamp should be made of either spring wire or music wire. It is a simple task to form a coil spring by clamping a piece of round steel or wood in a vise, together with one end of the wire, and coiling the wire about the round piece with the aid of a pair of small-nose pliers. The loop should be just large enough to slip over the neck of the bottle.

Lubricants For Press Fits

By P. H. GERGENS

IT is sometimes necessary to join together, with a press fit, parts which may have to be separated later. In the meantime, a tight fit is absolutely necessary. While serving as an erecting engineer on heavy machinery, I found that while many of these fits seemed to meet all requirements at the time of erection, they worked loose with a few months of service. Upon taking the shafts out of the rotors, it was frequently found that serious corrosion had taken place, causing play between the rotor and the shaft. In other cases, when it became necessary to disassemble the parts, it was found almost impossible to do so, the two parts having grown together so that heating and excessive pressure were required to separate them.

Both of the above conditions are due to the same cause. In the writer's opinion, the cause is lard oil, which had been used at the time of pressing the parts together. In such cases, lard oil is frequently used as a lubricant. In the course of time, the lard oil becomes rancid, producing an acid which corrodes the metal. The particles of rust act as catalyzers which take oxygen from the air and combine it with the steel, promoting progressive oxidation and rusting or corrosion. In some cases this condition is accelerated by electrolytic acid, due to magnetic currents set up in the shafting.

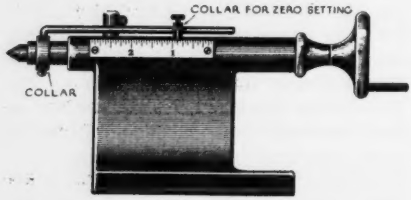
The use of lard or other oils which may become rancid with age is a potential source of trouble. A high grade mineral oil is much preferable,

and the oil should be mixed with a small amount of graphite, which will increase the lubricating properties. The writer has also used petroleum jelly and even vaseline in instances where it was impossible to obtain graphite. These facts are worth remembering where press fits are required to remain tight, yet in condition so that the parts may be disassembled when necessary.

A Useful Lathe Attachment

By JOSEPH PIGNONE

IT often becomes necessary, in lathe work, to use the tailstock to feed a drill or reamer into the work. As no provision is made on the average lathe for measuring the depth of feed in such a case, the workman is required to withdraw the tool at intervals in order to measure the depth of the hole. Some tailstock spindles are graduated, but no provision is made for zero setting, which is a decided disadvantage where it is impractical to unclamp the tailstock and where the tool is starting to enter the work when the graduation is at an odd division of the inch.



The scale and pointer save time when drilling or reaming with the tailstock spindle.

The illustration shows a measuring device which can be added to the tailstock without altering or marring it. The device is simple and easily constructed. It consists of a graduated scale which may be mounted by the simple expedient of drilling and tapping two small holes in the tailstock, and a rod that is attached to the spindle. A setscrew collar is fitted to the spindle, as shown in the illustration, the collar being drilled to receive a section of steel rod which is pressed into the hole. The rod, when bent, serves as the pointer slide rod. A similar collar, of smaller size, is fitted over the slide rod. This collar is mounted with a knurled setscrew and carries a pointer which overlays the graduations on the scale. A left-hand scale should be used, if possible, although a right-hand scale will do very nicely. The collar carrying the pointer can quickly be adjusted as required when the tailstock is to be used for drilling.

Parker-Kalon Issues Booklet on Self-Tapping Screws

The question, "How do self-tapping screws compare in security with other fastening devices?" is answered in a booklet that has been issued by the Parker-Kalon Corp., Dept. N, 200 Varick Street, New York, N. Y. This booklet, the title of which is "Why Self-Tapping Screws Make Stronger As Well As Cheaper Fastenings," gives the results of a series of tests in which self-tapping screws were used for the same purposes and under the same conditions as other types of fastenings. Complete data is given, together with illustrations of the parts in which the screws were used. The text includes descriptions of comparative tests made with various types of testing machines and presents the results of the tests by means of charts. A copy of the booklet will be sent to any mechanical executive.

Landis Bulletin H-75

Bulletin H-75, containing 10 pages of illustrations and descriptions of the 1-in. and 1½-in. Single and Double Head Landmaco Threading Machines made by the Landis Machine Company, Waynesboro, Penna., has been issued by that firm. Each major part of each of these machines is described and illustrated in detail, and the more important parts of the mechanism are indicated in the illustration. Copies of this bulletin will be sent, upon request, to any machine shop executive.

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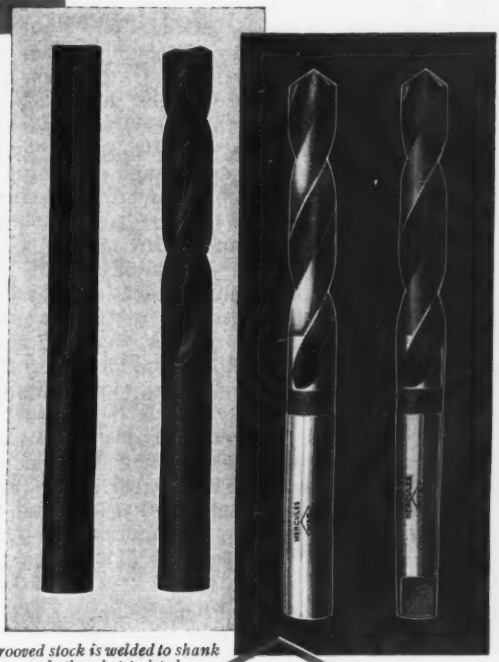
ROLLED GROOVED STOCK HOT TWISTED

AFTER 25 years of gruelling service, Hercules remains the world's greatest production drill. This singular achievement is the result of careful processing of rolled grooved stock.

Bar stock rolled to grooved shape in long lengths at the mill, under close supervision and accurately controlled temperatures, gives a greater uniformity of cross section and grain structure than would otherwise be obtained. The subsequent hot twisting again adds to the homogeneity of the steel, building in those qualities of uniformity and strength which have so characterized Hercules drills.

Because of these superior features, Hercules high speed drills will give unusually long service and aid materially in your effort to lower production costs. Our local distributor will give you immediate service —phone him today.



Grooved stock is welded to shank steel, then hot twisted.

WHITMAN & BARNES
INCORPORATED
New York — DETROIT — Chicago

W&B

MAKERS OF FINE TOOLS FOR 77 YEARS

Over the Editor's Desk

It's Your First Move

WHILE glancing through the pages of a paper trade journal the other day, we came upon this statement, "Every time one man puts a new idea across, he finds ten men who thought of it before he did. But they only *thought* of it." Which reminded us immediately of the short story on page 48 of this issue, under the title "Scrap." In this story Ellsworth Clark (who, by the way, is one of the manufacturing executives at the Westinghouse plant) tells us how the owner of a small shop got an "idee" that raised his business out of the "small shop" class and gave it the status of an industry.

How far Mr. Clark drew on his imagination in writing this story, we are not prepared to say, but we do know that fact is fully as strange as fiction in the matter of discovering commodities for which there is a ready market. More than one firm has found, in the course of trying to practice economy by finding a market for a by-product, that the demand for the by-product was much greater than the demand for the original product. Credit for success in such cases could only be credited to "luck," but luck shows a decided preference for playing with those who are willing to make the first move. The number of those who have tried and failed is insignificant compared to the number who have failed because they didn't try.

Conley, the great lecturer, used to tell about a man who sold his home and wandered all over the earth in search of wealth, and finally, old and worn-out, came back to the place of his birth to die—only to find that one of the greatest diamond deposits in the world had been found on the land that he abandoned.

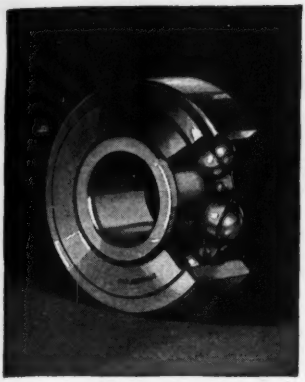
If you haven't read Mr. Clark's story, read it. You, also, may get an "idee."

The Worth of a Man

A CONSIDERABLE amount of controversy has developed over the publication of a statement that some of our industrial leaders receive—in salaries and bonuses—as much as $1,000,000 a year, and the question is raised as to just how much a man can be worth to his firm.

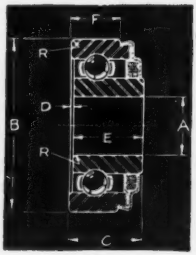
There is just one answer to that question; he is worth what he can get. All other factors being equal, the law of supply and demand dictates his value. If a man can find a firm that will pay him $1,000,000 a year, he is worth that much to that firm. The firm thinks he is worth it, and that makes it so. Safe to say, however, in this day and age, that his firm is not playing Santa Claus. The firm is willing to part with that much money only because it expects him to increase his firm's business by many times his bonus. He may have demonstrated that he is as valuable as the figure given above indicates, or his past record may have been such that his employers feel justified in betting on him to that extent, but one thing is certain—he is getting it because he can produce.

On the other hand, if no one could be found who would pay him more than $5 a day, it would be because the law of supply and demand had determined that his qualifications were no greater than those of thousands of other men and that therefore he was worth no more than that amount. Time spent in arguing about what some one else gets is wasted in so far as its effect upon our own value is concerned.



Another "PRECISION" Bearing

A Notably Better Bearing With Distinctive Economic Advantages



A self-contained, self-sealed, grease-packed, dirt-proof bearing with a larger grease capacity, ready for years of service without renewal of lubricant.

Needs only the most simple and inexpensive mounting with the very minimum of machining and assembling cost . . . An all-steel bearing, with a solid, one-piece center ring.

WRITE FOR THE "GREASEAL" DATA SHEETS, GIVING SIZES, AND DETAILS OF APPLICATION.

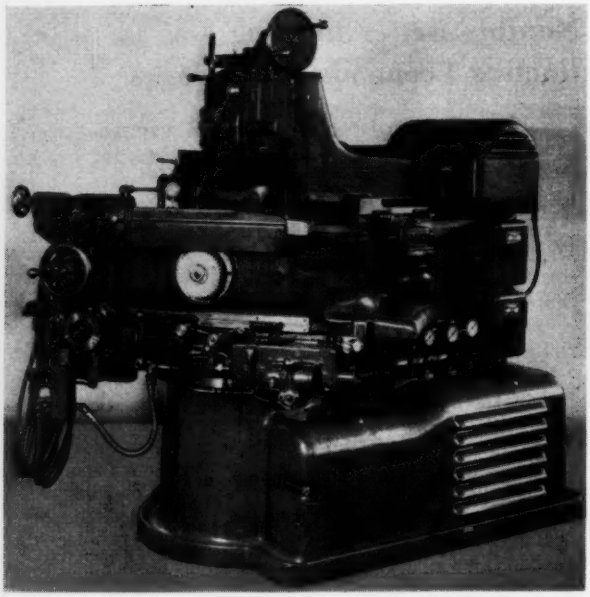
"GREASEAL"
FELT—PROTECTED

NORMA-HOFFMANN BEARINGS CORPORATION STAMFORD, CONN., U.S.A.

New Shop Equipment

Pratt & Whitney 10-In. Hydraulic Gear Grinder for Spur and Helical Gears

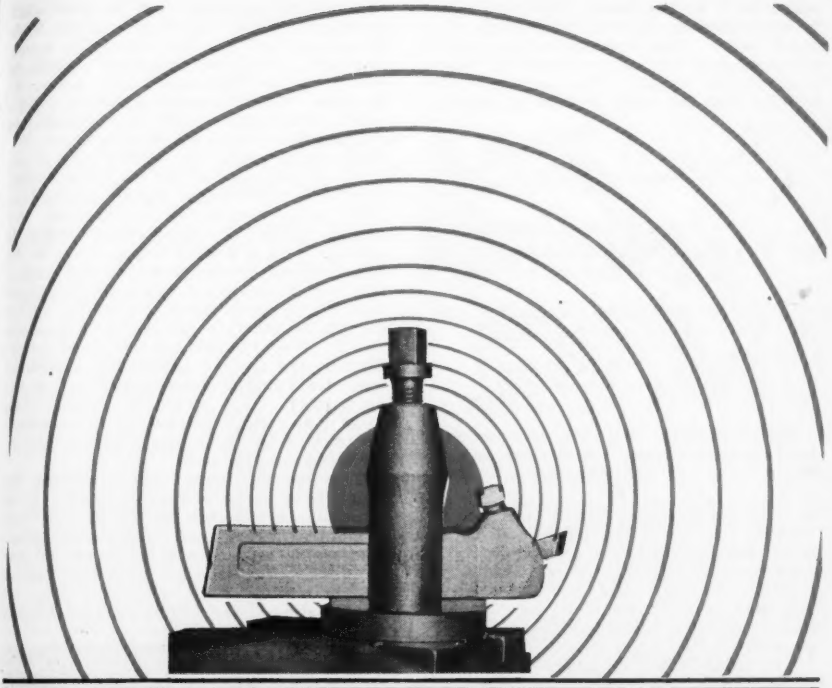
Spur and helical gears can now be finished by grinding, at a cost said to be as low or lower than other existing methods of gear finishing, by the use of a hydraulically-operated gear grinding machine which has been developed by the Pratt & Whitney Company, Hartford, Conn. It is said that the machine will remove all errors greater than 0.0002 in. with ease. The operating principle of the machine is extremely simple and accurate. The reciprocating horizontal ram, somewhat similar to that of a shaper, carries the grinding wheel back and forth through the teeth, generating adjacent sides of two teeth at the same time. The wheel is trued with straight sides and top, corresponding to the shape of a tooth in a master rack. The stack of gears being ground is rolled past the reciprocating wheel under the guidance of a master gear and rack, so that the wheel always engages the work tooth for tooth as the master rack engages the master gear. The wheel makes as many passes per tooth as are necessary for the finish desired. The work is indexed automatically when it has rolled to one side out of engagement with the grinding wheel, and machine stops automatically when all teeth are finished. A water pump supplies an abundant supply of coolant to the wheel and work during the operation.



P. & W. 10-in. Hydraulic Gear Grinder for spur and helical gears.

Power for the machine is supplied by two motors. A 3 h.p. motor is carried in a housing on the ram and drives the wheel spindle through a belt which is tightened by a spring idler pulley. Spindle speeds of 2215 and 2500 r.p.m. are provided, giving surface speeds up to 7000 ft. per min. A second 3 h.p. 1200 r.p.m. motor is mounted under the cover on the side of the bed and is direct-connected to two geared oil pumps and a centrifugal water pump. This motor supplies the power for the entire hydraulic system and for the coolant.

The ram is operated by a 2¾-in. piston motor which can produce ram speeds up to 50 ft. per min. The oil reaches the ram motor through a reversing and speed control valve on the right side of the bed, and exhausts through the same



TURNING PROFITS

The speed, success and *profit* of turning operations depend, in the last analysis, upon one thing—the performance of the cutting tool. The Tool Holder therefore should be selected with the same critical scrutiny as the machine which it equips for production.

Williams' "Agrippa" Tool Holders have many exclusive design and construction features which merit your investigation: features which reflect their advantages in terms of better work at lower cost. The "Agrippa" line covers every regular operation of lathe, planer and shaper. Ask for literature.

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TOOL HOLDERS
"THE HOLDERS THAT HOLD"

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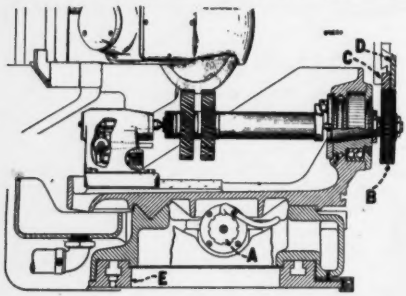
Boring-Tool Holder. Either sleeve or straight bar.

valve back to the tank. The ram speed is controlled as desired by means of a relief valve. The reversal of the ram is accomplished without perceptible shock, even at full speed. The ram assembly weighs 1100 lbs. and is held in position



Section through table and work spindle. A—Table piston motor. B—Master gear. C—Master rack. D—Indexing rack. E—Swivel base.

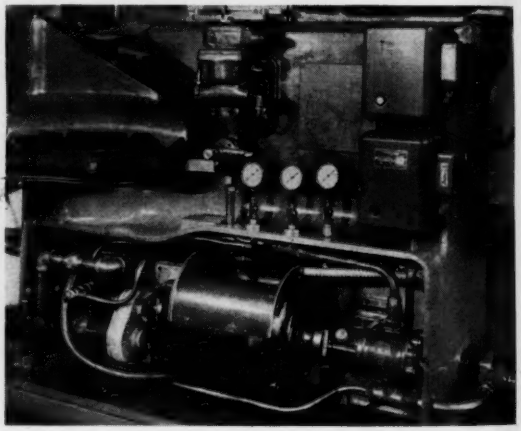
by its own weight. One V and one flat bearing are used, providing self-adjustment for temperature and wear. Two dogs provide adjustment for length and position through the reversing valve. The maximum stroke is 6½ in. The ram bearings are lubricated by pressure.

The table is driven hydraulically by a 3-in. piston hydraulic motor and is reversed automatically. The table bearings are of the same type as in the ram—one V and one flat—pressure lubricated, self-aligning and self-adjusting. The table operates at slow speed for grinding and at fast speed when indexing. Speeds are changed automatically from one range to the other by means of dogs which operate a valve to control the hydraulic motor. Either speed can be varied as desired. When the work is finished, the table is moved under power to the extreme right for ease in loading and unloading.

Gear blanks to be ground are mounted on regular grinding arbors with which a dog is used. The spindle is mounted in a large double row ball bearing made especially for this machine and preloaded to 500 lbs. The work spindle can be removed from its taper seat so that special spindles can be used when necessary. The footstock spindle holds the arbor tight on the centers by spring pressure, and the footstock spindle is moved by the horizontal lever shown on its side. The footstock itself is adjustable on scraped ways to accommodate arbors or work up to 14 in. long.

For spur gears, the center line of the work is parallel to the ram movement, and the work slide moves perpendicularly to the center line of the work. For helical gears, the work slide, which is mounted on a swivel base, is set to the helix angle of the gear to be ground, the ram movements remaining in direction. The work slide, as before, moves perpendicularly to the center line of the work. The helical gear is thus generated by the same combination of straight line and rotary movements as is the spur gear. The accuracy of the helical gear is as easily obtained and maintained as that of the spur gear, there being no twisting motion used.

The master gear which guides the work is a duplicate of the gear to be ground, in number of teeth and face diametral pitch, and the master gears and racks are usually of hardened and ground steel, although cast iron master gears may be used when the runs are short. The entire hydraulic system may



Motor, oil pumps and water pumps which supply the hydraulic drive and coolant section through table and work spindle.

be started and stopped at any time instantaneously by means of an emergency lever conveniently located on the front of the machine. All indexing, reversing,

FORMICA GEAR CUTTERS

The Akron Gear & Eng. Co.
Akron, Ohio
Farrell-Birmingham Co., Inc.
Buffalo, N. Y.
Slayman & Company
Baltimore, Md.
Harry A. Moore, Bangor, Me.
The Union Gear & Mach. Co.
Boston, Mass.
The Atlantic Gear Works
Brooklyn, N. Y.
Chicago Rawhide Mfg. Co.
Chicago, Ill.
Perfection Gear Company
Chicago, Ill.
Chicago Gear Company
Chicago, Ill.
The Cincinnati Gear Co.
Cincinnati, Ohio
The Greaves Machine Tool Co.
Cincinnati, Ohio
The Horsburgh & Scott Co.
Cleveland, Ohio
The Stahl Gear & Mach. Co.
Cleveland, Ohio
The Master Electric Co.
Dayton, Ohio
The Adams Company
Dubuque, Iowa
The Ferguson Gear Co.
Gastonia, N. C.
Excello Machine Co.
Grand Rapids, Mich.
Hartford Special Machinery Co.
Hartford, Conn.
Dedman Foundry & Machine Co.
Houston, Texas
Precision Machine Co.
Milwaukee, Wis.
Generating Gear Co.
Milwaukee, Wis.
Mobile Pulley & Machine Wks.
Mobile, Ala.
Berkley Mach. Works and Foundry Co., Norfolk, Va.
Meisselbach-Catucci Mfg. Co.
Newark, N. J.
E. M. Smith & Company
Peoria, Ill.
Sier-Bath, Inc.
New York City, N. Y.
The Earle Gear & Mach. Co.
Philadelphia, Pa.
The Pittsburgh Machine & Supply Co., Pittsburgh, Pa.
Standard Gear Company
Pittsburgh, Pa.
Rodney Davis and Sons
Philadelphia, Pa.
The Turley Gear & Machine Co.
St. Louis, Mo.
Perkins Machine & Gear Co.
Springfield, Mass.
Winfield H. Smith, Inc.
Springfield, N. Y.
Alling Lander Company
Sodus, N. Y.
Charles E. Crofoot Gear Corp.
South Easton, Mass.
Arlington Machine Co.
St. Paul, Minn.
Diefendorf Gear Corp.
Syracuse, N. Y.
Worcester Gear Works
Worcester, Mass.
Massachusetts Gear & Tool Co.
Woburn, Mass.

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The Formica Insulation Company
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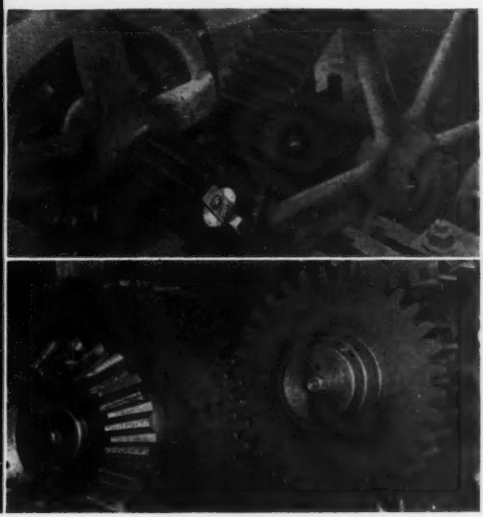
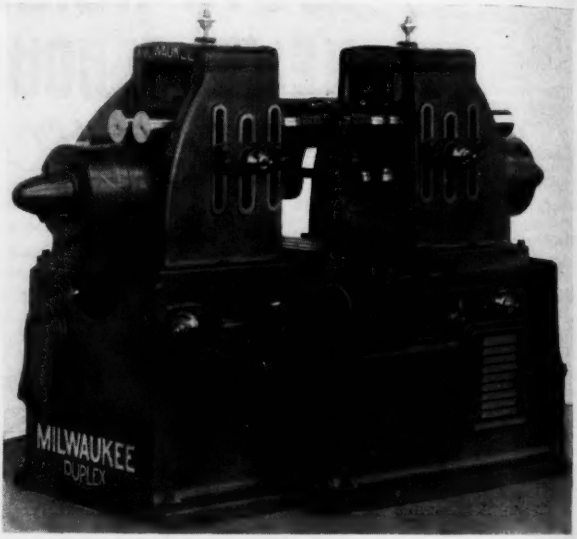


FORMICA *Non-Metallic* GEARS

and speed controls are hydraulic and are interlocked when necessary. The machine can be changed over for different gears with a very small tooling expense.

The wheel is dressed so that its periphery is, in shape and size, that of the straight-sided basic rack of the involute system. Dressing is accomplished by the use of three diamonds, one in each of three sliding bars that are operated by a single lever. The two bars for dressing the sides of the wheel are adjustable independently by a vernier to angles from 13 deg. to 30 deg. by minutes. The third bar, for dressing the outside of the wheel, is not adjustable.

The capacity of the machine is as follows: Pitch diameter, maximum, 10 in.; minimum, 1 in. Diametral pitch, max., 3; min., 16. Pressure angle, 13 to 30 deg. Helix angle, either right or left hand, 45 deg. Width of face, max. for spur gears, 6 in. For helical gears, width of face which can be ground may be less than 6 in., depending on the helix angle. Wheel diameter, 12 in. Wheel spindle speeds, 2215 and 2500 r.p.m. Ram speed, up to 50 ft. per min. Floor space required, 66 x 82 x 67 in. high. Net wt., 5,400 lbs.



Milwaukee Duplex Milling Machine.

Milwaukee Duplex Milling Machine

A Duplex Milling Machine of the production type with spindle speeds up to 1000 r.p.m., and table feeds up to 100 in. per minute, has been announced by Kearney & Trecker Corporation, Milwaukee, Wis. Known as the Milwaukee Duplex, this machine is basically constructed for the use of tungsten and tantalum carbide milling cutters. Outstanding among the many features of this machine is the strength and rigidity embodied throughout its entire design so that the higher speeds and faster feeds of these cutting alloys may be fully attained.

Three speed ranges are available: 15 to 150 r.p.m., 30 to 300 r.p.m., or 100 to 1000 r.p.m., each of which has 12 speed changes. The changes to each spindle are made independently so that cutters of different sizes can be used as desired. In addition, it is possible to provide one spindle with any one of the three speed ranges, and the opposite spindle with either of the other two. There is also a choice of three ranges of feeds; namely, ½ to 20 in. per minute, 1 to 40 in. per minute, or 2½ to 100 in. per minute. Each range has 18 individual feeds. The power rapid traverse for the table is 240 in. per minute.

The Duplex machine is made in both 1200 and 1800 series. The table for the 1200 series is 12 in. wide, and is furnished with longitudinal power feeds of either 18, 24 or 30 inches. The table for the 1800 series is 18 in. wide and can be equipped with power feed of either 24 or 30 inches. The height of the table above the floor is 32 inches. Each spindle is mounted in a heavy forged quill which is heat-treated, hardened, and ground. These quills are 7 in. in diameter and are provided with independent cross adjustment of 7 in. each. Movement of each quill is by a handcrank attached at the front side of the uprights, the side at which the control levers are located. Each quill is provided with a heavy brace

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USERS of the Cincinnati "HYPRO" Openside planers know that these machines may be depended upon to do the rough work as well as the accurate work . . . and do both at a *profit*.

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But, that's not the whole story . . . there are many features of the Cincinnati "HYPRO" Openside planer that you should know about. Write us for the details.

The
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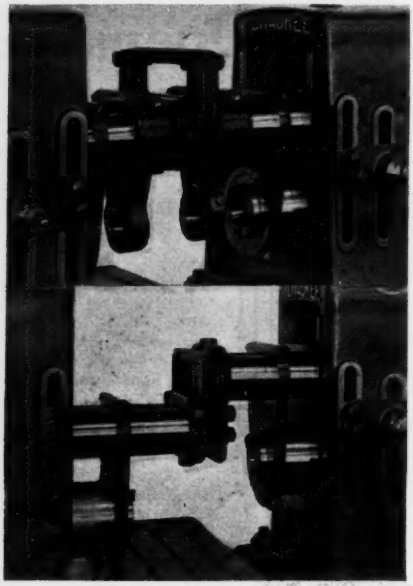
Cincinnati "HYPRO" Openside Planer

that ties it directly to the over-arms, so that the quill receives a rigid support throughout its entire cross adjustment.

Each spindle is driven by herringbone gears which are unusually heavy in construction and hardened for resistance to wear. The drive differs from usual practice inasmuch as the large gear is solidly attached to the spindle and the driving pinion is splined to the pinion shaft. This feature insures a positive, smooth drive to each spindle throughout the entire cross adjustment of the spindle quills.



(Above)—Spindles bracketed together on the same plane, forming a rigid truss. (Below)—The bracket may be used with one spindle higher than the other.

The double overarms of each spindle block can be laced together as shown in the illustration, so that both spindles lie on the same plane. Likewise, these brackets are designed so that the overarms can be bolted together regardless of the vertical position of each spindle block. This method of tying together the overarms, spindle braces, and quills forms a rigid truss. The spindle blocks are mounted between two uprights and are aligned by bearing surfaces for their full length. They are guided by a deep tongue slide and held to adjustment with a full-length gib. Vertical adjustment of these blocks is by a handcrank, also attached at the side of the machine having the control levers.

An innovation in table design is the method of mounting the dogs in a fully-enclosed compartment. By enclosing the dogs in this manner, chips cannot interfere with their operation. The machine is automatically lubricated throughout by means of a geared-type pump which is driven from the main drive shaft. A large geared-type pump is used to distribute the coolant, operating only when the spindle is rotated. The pump is made as a self-contained unit, and is driven by a sliding gear that can be disengaged by operation of a small lever.

All rotating members of the machine, with the exception of the spindle noses, are fully enclosed, which is highly important from a standpoint of safety. The hinged guard which protects the draw-in bolt can be lowered by releasing a thumb screw.

The machine is equipped with a multiple V-belt drive, consisting of four belts. Adjustment of the belt to proper tension is attained by adjustment of a pivoted bracket onto which the motor is mounted. All machines are arranged to accommodate either 7½ or 10 h.p. motors. The weight of the machine is: 1200 Series, 11,500, 11,650, or 11,800 lbs.; 1800 Series, 12,300 and 12,450 lbs.

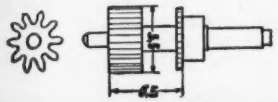
Starrett No. 150 Hacksaw Frame

The illustration shows a hacksaw frame that has been placed on the market by The L. S. Starrett Co., Athol, Mass. This frame, which is known as the No. 150, has a throat just deep enough to accommodate the blade. The particular advantage of a frame of this type is that cuts can be made more easily and quickly in spaces offering hardly more than an inch of clearance. This construction also results in improved balance and rigidity, making the frame

Starrett No. 150 Hacksaw Frame.

especially handy for cutting small pipe conduit, tubing, insulation, and so on. The frame has no tendency to wobble on shallow cuts of this nature, the blades can be strained tighter with less danger of breaking, and the cut can be made with one hand while the other is used to steady the work. The frame is fitted with the usual Starrett four-way blade adjustment.

Hobs—



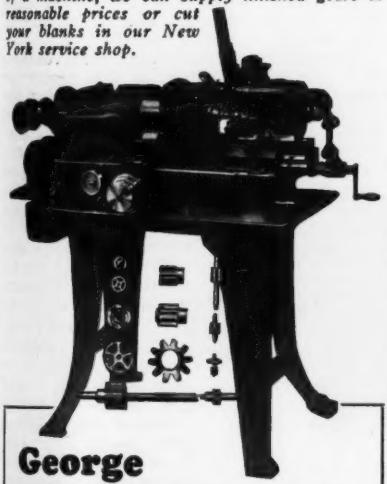
153 Nickel Pinions Every Hour!

SHOWN above is a drawing of a ¼" diameter Nickel Pinion which is being hobbed on a KOEPFER Automatic Hobbing Machine at the rate of 153 per hour . . . *and every pinion is extremely accurate.*

Such accurate results are assured by the hobbing process which generates a theoretically correct tooth form. The high production is assured by the magazine feed which eliminates all non-productive loading time.

You, too, can obtain equally as good results in your shop. Let us show you. Write for catalog WMI.

If your requirements do not justify installation of a machine, we can supply finished gears at reasonable prices or cut your blanks in our New York service shop.



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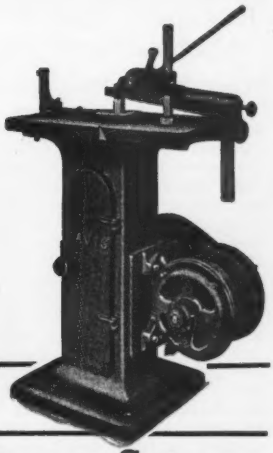

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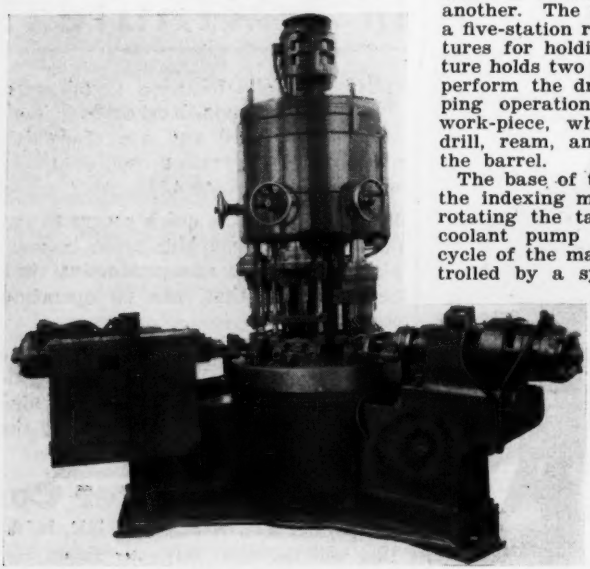
Ex-Cell-O Vertical Automatic Machine For Drilling, Reaming, and Tapping

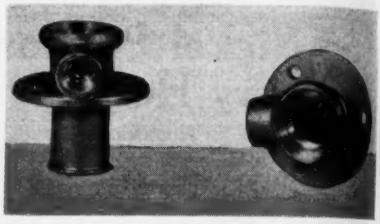
The illustration shows a vertical automatic machine that has been developed by the Ex-Cell-O Aircraft & Tool Corporation, 1202 Oakman Blvd., Detroit, Michigan, for performing multiple operations in the same hole of a given part. The machine is shown with the vertical unit and three horizontal units that were required to drill, ream, and tap a hole in the bronze part shown in the second illustration.

The vertical spindles are contained in a single unit in the upper portion of the machine proper, and are driven by one motor through interchangeable feed cams. Pick-off gears make it possible to change the speeds of these spindles to suit the individual job, whether requiring multiple head mounting or single spindle. Thus the cycle of one unit with relation to another may be accurately timed for handling different operations, such as drilling, tapping, reaming, counterboring, and so on. A circulating lubrication pump carries oil to a reservoir at the top of the unit and distributes it to the various points of the mechanism contained in the housing.



Ex-Cell-O Vertical Automatic Machine for drilling, reaming, and tapping a bronze part.

On the machine shown, all the units are equipped with multiple heads. The heads provide from two to four spindles each, depending on the operation. Each head is equipped with spring guide bars and bushing plates, the guide bars not only carrying the bushing plates but also insuring rigid alignment between the drill head and the fixture as the work is indexed from one station to another. The machine is equipped with a five-station rotary table, carrying fixtures for holding the work. Each fixture holds two parts. The vertical units perform the drilling, reaming and tapping operations in the flange of the work-piece, while the horizontal units drill, ream, and tap the ½-in. hole in the barrel.



Part for which the Ex-Cell-O machine is arranged.

The base of the vertical unit contains the indexing mechanism and motor for rotating the table, with space for the coolant pump and sump. The entire cycle of the machine is electrically controlled by a system of relay switches mounted in a panel box, attached to the horizontal unit shown at the left in the illustration. Every precaution has been taken to safeguard the mechanism of the machine should any unit fail to perform properly; thus, it is impossible to index the table while the spindles are in operation or to start the feed while the table is indexing. The control lever for starting and stopping the machine is conveniently located for the operator. The machine can be used to handle vertical operations only, when required.

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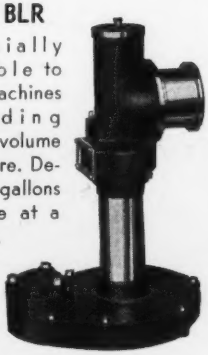

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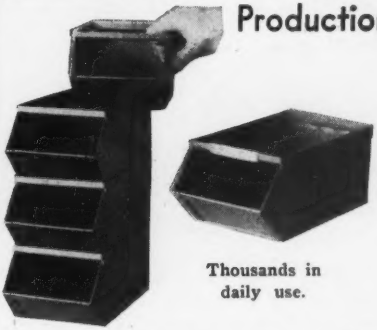

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1	5½ in.	4 in.	12 in.
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3	9 in.	6½ in.	18¼ in.
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Special sizes furnished to meet individual requirements.

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Baker No. 3 Duplex Cam Feed Pipe Machine

The illustration shows the No. 3 Duplex Cam Feed Machine with a two-spindle head at each end and a special fixture and control for facing, boring, threading and tapping pipe which has been placed on the market by Baker Brothers, Inc., 898 Post Street, Toledo, Ohio. This set-up shows the machine arranged for cutting a 2½-in. diameter thread on a 9-ft. length. The machine is also designed so that it can handle 6-ft. lengths and thread diameters of 2 in. and 3 in.

Baker No. 3 Duplex Cam Feed Pipe Machine.

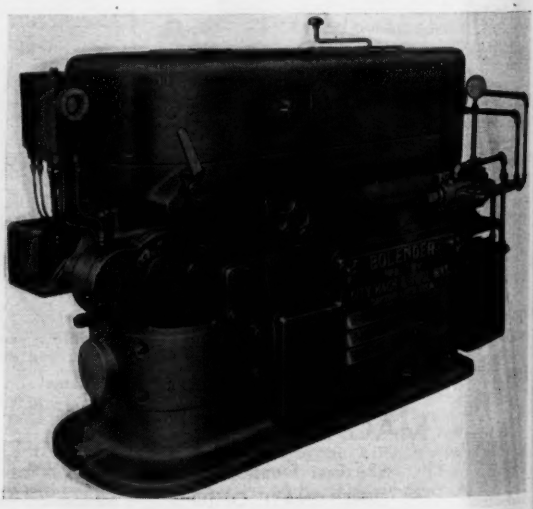
To operate, the operator rolls a piece of pipe onto a carrier which rolls under the first station, after which it is raised by air at each end into jaws that fit over a hexagon section near the end of the pipe. The machine is started, the cam rapid traverses the tools to the work and the tapped end is turned and faced. The piece is then dropped into the carrier and moved to the second position where it is again raised into jaws where it is held while the turned end is threaded and the opposite end is tapped. The piece is then lowered and automatically rolls off the machine to the rear on a slide that has been provided for the purpose. In the meantime, while the machine is in operation, another piece has been loaded in front so that after the machine is once started, one section of pipe is completely turned, bored, faced, threaded, and tapped at each cycle of the machine.

A positive lead is provided for the threading tools. The operator's functions are confined to loading the machine; the operation is entirely automatic. Change gears provide for changing the speed of the machine. The heads are set up to provide a speed of approximately 60 ft. per min. on turning and boring operations, and 30 to 35 feet per min. for tapping operations. Extra cams can be provided to change the lead according to the taps used. The fixture carriages are provided with adjustment so that pipes of various lengths can be handled, the only change necessary being in the driving bars. The support for these bars is always close to the work.

The operation cycle is started by pressing a push button; when the cycle is completed, the machine automatically stops. The tool carriage and elevating jaws are actuated by air, the control handles being conveniently located. As taps and dies are of the collapsibie type, no reverse is necessary. The total weight of the machine, as shown, is 23,000 lb. Length overall, 17 ft. 6 in.

Bolender Model 2-H Gear Burnisher

The City Machine & Tool Works, June and East Third, Dayton, Ohio, an-



Bolender Model 2-H Gear Burnisher.

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Standard of Accuracy

A SET of Lufkin Micrometers for final inspection should be standard equipment in every shop or tool room. Protected in a well-built, compact wooden case, a set of six micrometers, from zero to six inches, will insure your precise work.

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THE LUFKIN RULE CO.

WINDSOR, ONT. PRECISION TOOL DIVISION SAGINAW, MICHIGAN NEW YORK CITY

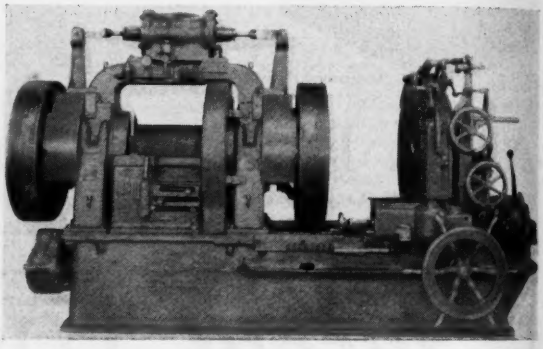
nounces a gear burnishing machine in which hydraulic pressure is used instead of the air pressure that has been used to operate these machines heretofore, to be known as the Bolender Model 2-H Gear Burnisher. It is said that the hydraulic pressure makes possible greater uniformity, together with a cushioning action which is highly desirable. This machine is of extra heavy construction, compact, and is completely automatic. The operator's functions consist in loading the machine, throwing the control lever that turns on the hydraulic pressure, and pressing a button. The gear will be revolved under hydraulic pressure a given number of revolutions in one direction, automatically reverse, revolve an equal number of revolutions in the opposite direction, and automatically stop. The operator then changes the work-piece and the cycle is repeated.

The number of revolutions that the gear can be burnished in either direction may be varied from approximately three to thirty. An open-faced dial permits a constant check on the pressure, and a conveniently-located control valve permits varying burnishing pressure from zero on up to the maximum of the hydraulic unit, which is much higher than will ever actually be required on a burnishing operation. The machine is designed for the mounting of master burnishers either with bronze or roller bearing mountings, and has a capacity for gears up to 14 in. diameter. This capacity can be increased to 25 in. diameter at a slight additional cost. The operation of the machine is extremely fast and the set-up requires a minimum of time.

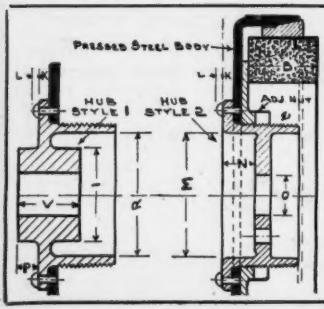
The cost of operating the hydraulic machine is much less than the cost of operating a similar air-operated machine, and it has the additional advantage of eliminating dependence upon the regular plant air-lines.

Landis Air-Operated 8⅝-in. Pipe Threading and Cutting Machine

The illustration shows an 8⅝-in. pipe cutting and threading machine with air-operated chucks which has been placed on the market by the Landis Machine Company, Waynesboro, Penna. The use of air-operated chucks not only eliminates the laborious task of operating the chucks by hand, but also saves an important percentage of time and elimin-



Landis Air-Operated 8⅝-Inch Pipe Threading and Cutting Machine.



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CHUCK

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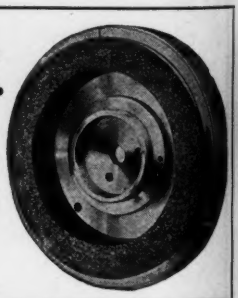

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Two *New* Gages

A new adjustable flat plug gage for gaging large holes with speed and accuracy and a new adjustable snap gage for checking shoulder work have been developed to increase your gaging efficiency.

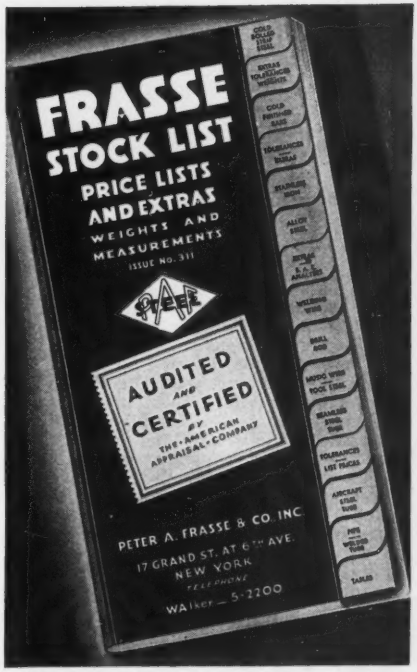
The gaging members of the flat plug gage may be expanded by means of an eccentric adjustment, locked and then can be reground.

The adjustable members of the snap gage may be set to any desired limits within its range, positively locked by a newly designed clamping device and sealed.

Send for the new Taft-Peirce descriptive folder.

The Taft-Peirce Manufacturing Company
WOONSOCKET RHODE ISLAND, U.S.A.

STYLE 9042



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ates the possibility of the work becoming loosened during the threading operation.

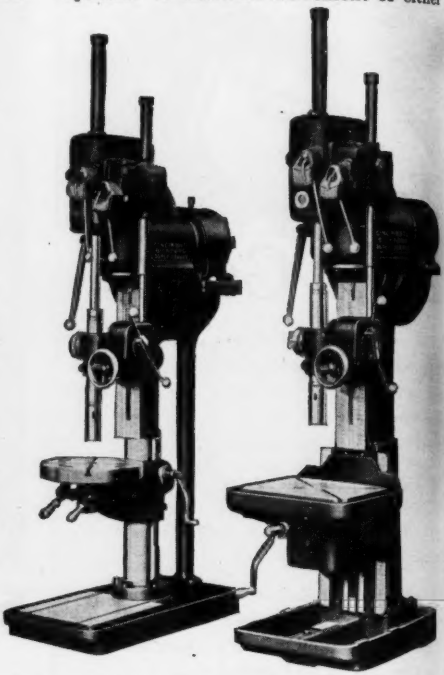
The air is controlled through a four-way valve which automatically returns to the neutral position when the operator removes his hand from the control lever. The air consumption is said to be exceedingly low.

Cincinnati Bickford "Super Service" Upright Drilling Machine

A new type of 21-in. and 24-in. upright drilling machine, to be known as the "Super Service," has been announced by The Cincinnati Bickford Tool Co., Oakwood, Cincinnati, Ohio. The machine, which is shown in the illustration, is built in either the round or box column type of construction and may be equipped for either general purpose or single purpose work.

The standard machine has 12 spindle speeds, obtainable through selective sliding gears and controlled by a single lever. The gears are of heat-treated chrome nickel steel, mounted on shafts having integral multiple keys. Ball and roller bearing construction is featured and all mechanism is automatically flooded with oil. Direct reading plates indicate the speeds and also indicate nine rates of feed, which are also controlled by a single conveniently-located lever. The feed changes are obtained through selective heat-treated alloy steel sliding gears with broached integral keys. No belt or drive key feed mechanism are incorporated in these machines.

The sliding head is accurately counterbalanced and is fully enclosed. The drop worm type of feed engagement has been replaced by a constant mesh worm, dipping in oil. The feed is engaged by either of the two pilot levers which control the advance and return of the spindle. A sidewise movement of either of these levers engages a positive-type feed clutch similar in design to the clutch used so effectively for this purpose in the "Super Service" radial drill.



Cincinnati Bickford "Super Service" Upright Drilling Machines with round and box-type columns.

The Ideal Speed Lathe

(PATENT APPLIED FOR)

FOR lapping-finishing-polishing of small parts —bushings, handles, wire dies, etc. Totally inclosed ½ H. P. motor, with two speeds, 900-1800 or 1700-3400 R.P.M. Automatic brake—Universal or Collet Chuck—Hole throughout length of spindle.

Write for "IDEAL" Speed Lathe Bulletin.

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MFRS. OF ELECTRIC TOOLS SINCE 1907

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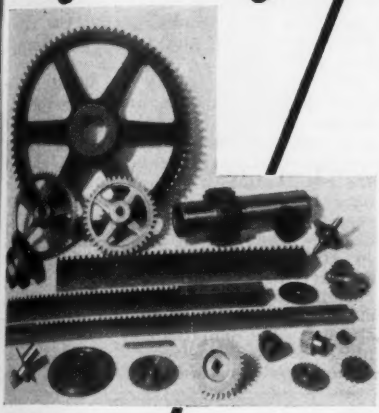

This illustration shows a few of the different types of M-C Gears.

Every M-C Gear Product . . . from pinion rod to internal gears . . . is made accurate enough to meet all requirements . . . accurate enough for any machine or precision instrument.

Our unusual manufacturing facilities . . . together with our years of experience . . . makes M-C Gears the best you can buy.

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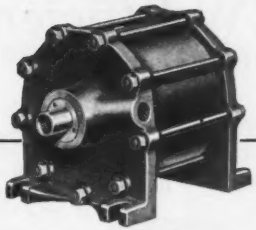
M-C GEARS



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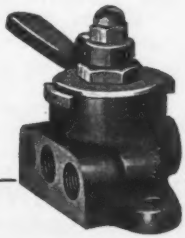
Cuts Costs

And, **quick action** is what you get from every LOGAN Air Operated Device! It is this **quick action** which helps to eliminate waste of time, effort and motion.

Try one or two LOGAN Air Operated Devices on your work. They are made in a wide variety of sizes and types to meet every requirement.

Catalog S-25 describes and illustrates the full line of LOGAN Cylinders, chucks, valves, etc. Send for your copy today. It will help you solve your work holding problem.



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LOGANSPORT, INDIANA

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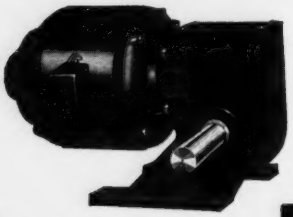
NEW Efficiency
In SPEED REDUCTION

NEW Compactness
In DRIVE ASSEMBLY



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Speed Reducers

MOTOR, coupling and speed reducer —all in one compact unit. Simple, solid construction insures sturdiness and perfect alignment of gears and shafts permanently. Gives you full, uniform delivery of power with greatest efficiency. Application is simple as putting on a motor alone. Made in Single and Double Reduction Worm Gear types and Single Reduction Spur Gear type. Standard ratios from 2:1 to 60:1. Motors 1/30th to 3/4 H.P.—A. C. or D. C. Write for Bulletin SR-131.

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An adjustable feed trip may be set to disengage the feed at the required depth. Safety trips automatically disengage the feed at the top and bottom limits of travel.

The driving motor (3 or 5 h.p.) is direct-connected and its close-coupled mounting locates it out of the operator's way and in a position where chips and dirt cannot cause damage. On the round column machine a worthwhile improvement has been made in that the table arm, as well as the table, is clamped from the front.

The driving clutches are built along Cincinnati Bickford's unit principle of design by being completely assembled in a self-contained drum housing. They are mounted on large ball bearings and are automatically flooded with oil. The forward and reversing clutches are actuated through internal expanding rings of heat-treated bronze, fitted into hardened steel cups which are integral with the driving bevel gears. The driving clutches operate at constant speed, insuring maximum power at all spindle speeds. The drills can be had as single units, or combined into gang drills of either the high base or low base type.

Red Giant Model H Lift Truck

The line of material handling equipment manufactured by The Revolvator Company, 352 Garfield Avenue, Jersey

Red Giant Model H Lift Truck.

City, N. J., has been augmented by the addition of the lift truck shown in the illustration. This lift truck, which is known as the "Red Giant Model H," has a number of features which are intend-

"TWO MACHINES IN ONE"...

...That's what you get in the RHODES "Convertible" Shaper and Slotter . . . a double duty machine that gives you double advantages.

The RHODES "Convertible" is adaptable to a great variety of uses in the shop. As a shaper, or as a slotter, it provides the means of economically handling a wide range of work, ordinarily assigned to larger machines.

Let us tell you all about this space-saving, money-saving, modern shop tool Write for a circular.

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Reduce Overhead!

Use

Self-Oiling All-Geared Machines

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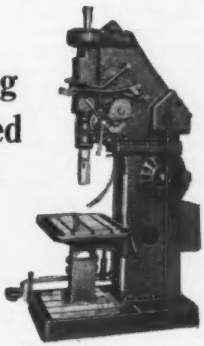
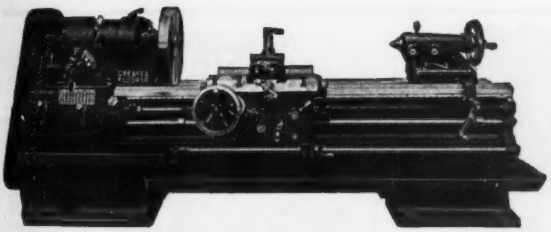
Write for Catalog U



No. 242—Capacity 2", swing 24".

Barnes Drill Co.
801-851 CHESTNUT ST.
ROCKFORD, ILLINOIS, U. S. A.



For Real
Lathe Efficiency
Specify

G-K Single Lever Control

SHOP SUPERINTENDENTS specify G-K Single Lever Control lathes because they are efficient . . . they turn out work faster . . . and are easy to operate.

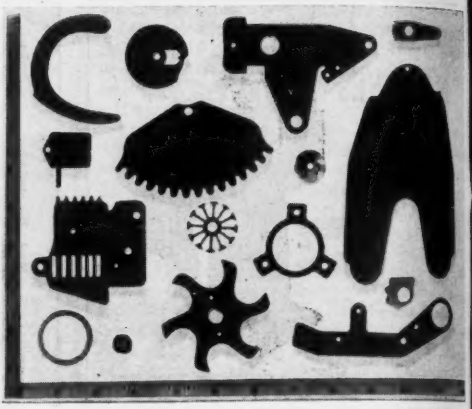
For instance . . . shifting speeds. Instead of searching through several combinations of levers for the proper spindle speed, the operator selects any speed of an extremely wide range, *through only one lever!*

Get the details of this, and many other features. Send for a G-K Catalog.

The Greaves-Klusman Tool Co.
CINCINNATI OHIO

ed to add to the life of the truck and make it easier to operate.

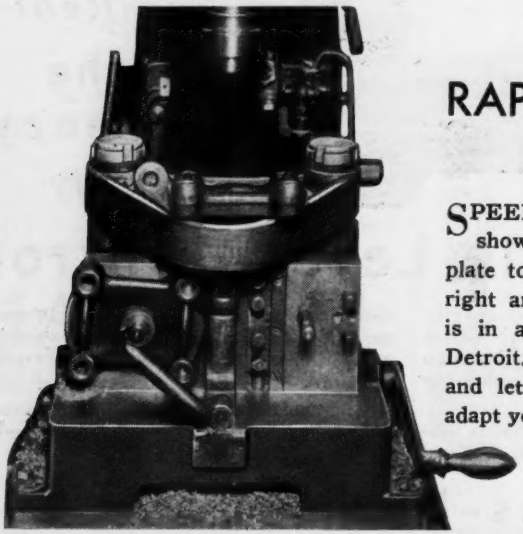
The upper frame of the truck is suspended in a central position, which precludes the possibility of distortion. A rolling cam release is provided, which not only makes operation easier but also saves wear on the latch. The latch is double, allowing the operator to pause in changing his position when lifting a load. There are no shifts turning in the side bars to wear holes and reduce the lift of the truck. A welded rear link unit provides longer bearing surfaces. The tongue is detached when the truck is dumped, making it impossible for the handle to kick back. The design of the truck includes a balanced handle, heat-treated steel links, rounded rear corners, and anti-friction bearings.



Samples of work turned out with temporary compound die by Dayton-Rogers Manufacturing Co.

Dayton-Rogers Offers Blanking Service

Dayton-Rogers Manufacturing Company, 1114 South Third Street, Minneapolis, Minn., is offering a service for the production of metal stamp blanks of any thickness up to ¼ in. without the use of expensive dies. The blanks are stamped out with a special temporary compound die of any size and shape, at a cost which is said to be a small fraction of the usual cost of a standard



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RAPID CLAMPING
DRILL JIGS

SPEED UP your production. Cut shows a Type B-10 with oval top plate tooled complete for drilling a right and left hand part. This job is in a large automobile plant in Detroit. Mail in your blue prints and let us show you how we can adapt your drilling parts to our Jigs.

Send for our new catalogue No. 3.

SIEWEK TOOL COMPANY, Detroit, Mich.

A Precision Tool

To Hold Work At Any Angle

ON drill presses, milling machines, grinders, planers, shapers, etc., you'll find the BOSTON Universal ANGLE PLATE a real cost cutting precision tool . . . always busy.

It is a practical way of insuring against all the time consuming delays of setting-up. Graduated to 360 degrees horizontally and 120 degrees vertically with verniers for each graduation, it may be readily adjusted to within 5 minutes of any required angle.

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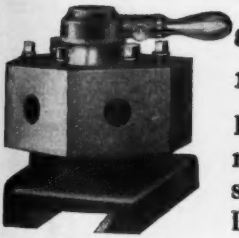

STYLE "0"

Hexagon head, for round shank tools and bolted on fixtures.

8 Styles

12 Sizes

For any make or size of Lathe, old or new.

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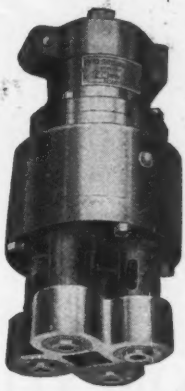
DEXTER, MAINE

Speed Up

DRILLING OPERATIONS

with a



U.S. Drill Head

WITH this simple attachment on your one-hole-at-a-time drilling machine, you can drill two, six, a dozen, or fifty holes, if necessary, in the same time it takes to drill one.

The drill head shown above is a single purpose tool for drilling four holes at one time. It is a fixed spindle multiple head, but we also make adjustable spindle multiple heads, which can be used on a variety of jobs. What is your problem? We will design a U. S. Multiple Drill Head to meet your particular needs. Send us your blue print NOW.

The United States Drill Head Co.

1954 Riverside Drive

CINCINNATI, O., U.S.A.

Designed Especially
FOR YOU

WHAT to the ordinary solid core drill is an expensive operation is turned into a very economical one by means of the ECLIPSE two-piece core drill.

The illustration shows twelve of them on a Moline "hole-hog" Drill Press core drilling valve holes of a well-known automobile engine.

Hundreds of these ECLIPSE two-piece Core Drills are in daily use throughout the industry . . . effecting worth-while savings wherever they are used. Investigate ECLIPSE TOOLS for your shop. Send the coupon!

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I'd like to see more of these cost-cutting tools. Send me a catalog.
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blanking and piercing die. This process is also said to be adapted to actual production where small runs are desirable, but have been impossible heretofore due to the high cost of tooling. The feature of this service consists in that stampings can be delivered in two or three days from the receipt of the order, with no die charges. Exact duplication of samples is guaranteed.

The illustration shows some of the work that has been stamped out by this process. The blanks shown are of brass, aluminum, cold rolled strip steel, fiber, bakelite, copper, and nickel silver, in thickness from 0.005 to ⅛ inch. The limits on the various dimensions vary from 0.001 to 0.005 inch. The pieces are exact duplicates of samples, with no burs.

Precision Universal Tool Head

A precision universal tool head that can be used in the milling machine, jig borer, drill press, or horizontal boring machine to perform boring, counterboring, facing, undercutting, turning, trepanning, recessing, or backfacing operations has been developed by The Precision Tool Company, Bridgeport, Conn. The tool is so designed that radial adjustment of a tool-carrying cross slide in a rotating tool head is brought under micrometer control of the operator, either in or out, while the tool head is rotating with the machine spindle and the tool is cutting. This feature is made possible through the use of a sleeve that engages a rack and pinion.

Precision Universal Tool Head.

The tool is exceptionally rigid, due to the fact that no loose shanks are used. The shank is forged integral with the central or driving part, which is one solid, heat treated and ground alloy steel forging from the tip of the shank tang to the bottom of the tool block slide. The tool block is of hardened and ground tool steel and is accurately fitted in gibbed, dovetailed ways.

It Pays

to Identify your Product and *It Pays* to order your

Steel Stamps
Burning Brands
Metal Checks
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Let us quote you on your requirements.

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Exceptionally Strong

SELF-OILING

Apex Universal Joints are simple in design, made of special alloy steel and heat-treated. Made to specifications.

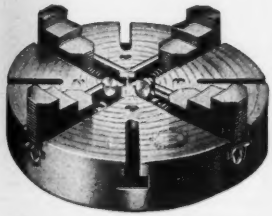
Let Us Quote On Your Requirements

The APEX MACHINE COMPANY

DAYTON, OHIO

Speed Up assembling operations with **APEX Universal Joint Socket Wrenches** in difficult places. Set nuts or bolts in one operation.

A WORN CHUCK COSTS YOU TOO MUCH



No. 264—Independent Chuck

Union Chucks

A worn chuck will make a monkey of any high priced machine.

But on the other hand, many an older machine needs only an up-to-date Union Chuck to make it good for years of highly satisfactory service.

A complete line with Iron and Steel bodies including:—

Iron and Steel Independent
Universal Geared Scroll
Universal Scroll Combination
Bull Dog Grip Face Plate Jaws
Drill Chucks

Write for catalogue and tell us your chucking problems

UNION MANUFACTURING CO., New Britain, Conn.

27 S. Jefferson St. Chicago, Ill. | 332 Sycamore St. Cincinnati, Ohio | 26 Cortland St. New York City, N. Y. | 661 Folsom St. San Francisco, Calif.

It may be locked instantly without disturbing the gib adjustment. Tools of any size or shape are solidly locked against a V-shaped seat in the tool block by two heavy set-screws, for which a T-handle wrench is provided. The tool seat is ground true with the shank after assembling, and, by means of the micrometer slip ring, can instantly be set dead central for drilling. It is not necessary to remove the tool head from the spindle for drilling; three-jaw drill chucks with hardened and ground adapters, by which they may be attached to the tool head, are furnished as standard equipment.

The tool is made in three sizes, providing a boring and facing range of from 0 to 10 in., or, by using an extension tool block, up to 24 in. Each tool is furnished in a wood case, complete with integral shank and straight cutter bar with angular cutter, as illustrated.

Peerless No. 3 Chamfering Machine

A universal type of the No. 3 Peerless Chamfering Machine has been announced by the City Machine & Tool Works, June and East Third, Dayton, Ohio. Several new features are incorporated in the design of this machine among which is a mechanism by which the cam for any desired pitch of gear is swung into position by the shifting of

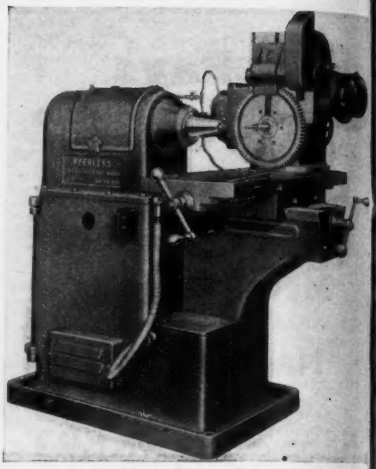
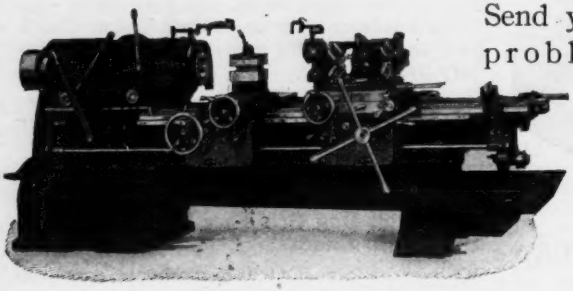


Fig. 1—Peerless No. 3 Chamfering Machine

Are You Retarding Production With Old Machines?

If you are attempting to meet present day competition with obsolete turret lathes you are retarding machine production and sacrificing your profit.



Send your production problems to our research department.

Our field engineers are always at your service.

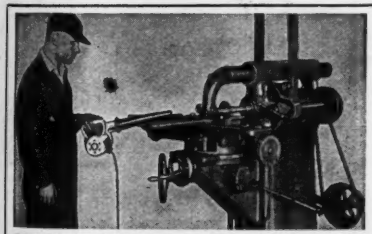
THE ACME MACHINE TOOL CO., Cincinnati, Ohio

The
PULLMORE
INDUSTRIAL CLUTCH

THE PULLMORE Industrial Clutch is employed as standard on many types of machinery, due to its extreme compactness and efficient operation. It is furnished in Single or Double types, and for operation in oil, or dry.

Let us supply you with additional details and make recommendations on any clutch application you may have.

ROCKFORD DRILLING MACHINE CO.
10 CATHERINE STREET
ROCKFORD ILLINOIS



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THE TORNADO Portable Electric Blower is the ideal all-purpose maintenance tool for machine shops. It is used for blowing, spraying insecticides, or as a handy vacuum cleaner. Hundreds of machine shops are finding it a time and labor saver for blowing away turnings, borings and grindings, blowing dust and dirt out of machinery and motors, painting, exterminating vermin and cleaning up floors, walls, pipes and office rugs
Let us send you one for ten days free. Write at once

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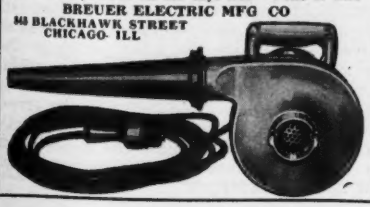

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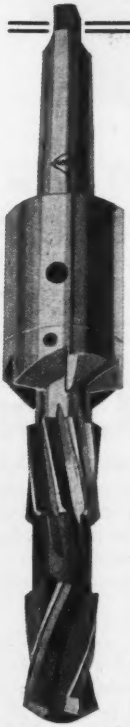
TOOLS



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the lever indicated as A in the illustration, Fig. 2. Figure 2 shows the lever in the proper position. This advantage is made possible by loading a number of cams of different pitch on a sliding shaft in the machine.

The worm and idler gear are unaffected by pitch change and the principal variable is a driving gear. This driving gear varies with the number of teeth in the work-piece; that is, each gear to be chamfered must be driven by a gear having an equal number of teeth, or double the number of teeth, as the work-piece. This is accomplished by the use of both the single and double thread quick change worm, and so necessitates

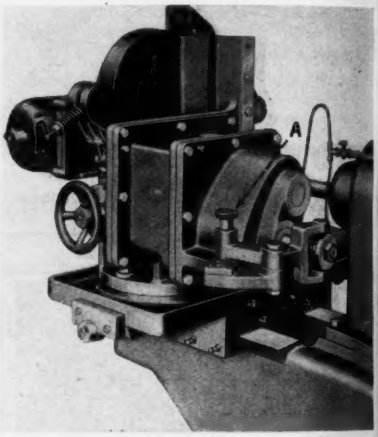

Fig. 2—View of Cam-Shifting Lever.

only approximately half the usual number of drive gears. On small lots, it will often be possible to use as a driving gear one of the gears to be chamfered, thus avoiding any additional expense whatever in this connection.

The machine is particularly useful where it is necessary to chamfer odd lots of gears. In such a case, the user merely shifts his cam lever to the proper cam position and uses a drive gear having either the same number or twice the number of teeth as the gear to be chamfered. This machine is particularly adaptable to the needs of jobbing shops, jobbing gear plants, machine tool plants, and other plants where the gears are of a varying nature and are manufactured in small quantities.

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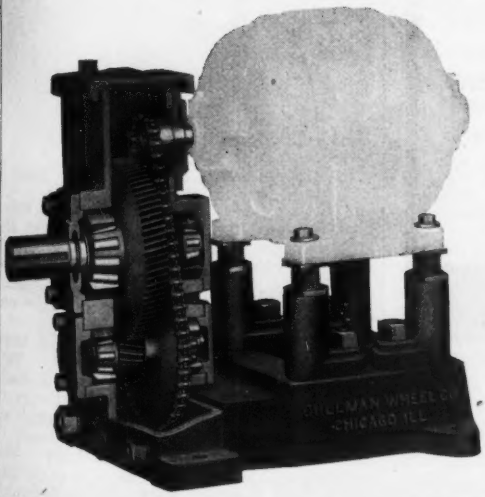

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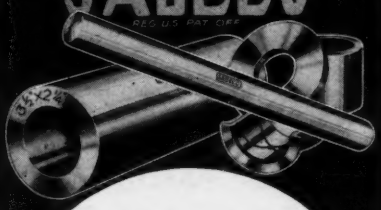

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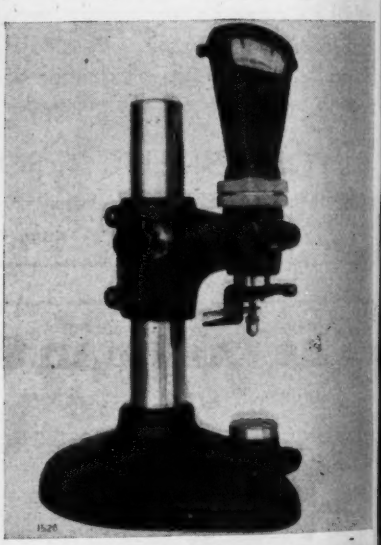
Societe Genevoise Micro-Indicator Stand

Through their American agents, The R. Y. Ferner Co., Investment Building, Washington, D. C., a new stand for inspection purposes has been placed on the market by the Societe Genevoise d' Instruments de Physique, of Geneva, Switzerland. This stand, to be known as U-3, is designed for use with their fan-shaped Micro-Indicator in which a knife-edge multiplication system is employed.

The stand has an oval-shaped base approximately 10 in. long and 7½ in. wide



Societe Genevoise Micro-Indicator Stand

at its widest point, and rests on three rubber feet. A socket integral with the base is provided at the forward end, which is bored accurately to a standard size to provide for the interchangeable mounting of different types of lower anvils or tables.

In the illustration is shown a table hardened and lapped optically flat. This table is 1⅝ in. in diameter and is made with crossed grooves to make it easy to wring a standard flat-surfaced gage on the anvil in setting the instrument to zero before beginning readings. The column of the instrument is 2 in. in diameter and is fitted with a rack for quick adjustment of the arm to the right height

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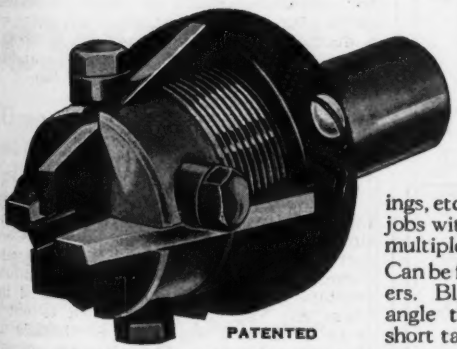

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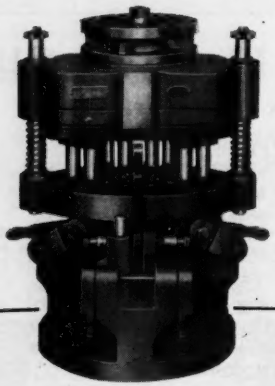

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by use of a pinion in the arm. The pinion is mounted in an eccentric bearing for accurate adjustment of the pinion to engage the rack smoothly. A heavy clamp at the rear of the column serves to clamp the arm securely when it has been set at the proper height. The arm supporting the Micro-Indicator can be adjusted through a range of six inches and since the axis of the indicator is 3 in. from the column, cylindrical parts as large as 6 in. in diameter may be tested on this stand.

The Micro-Indicator itself is mounted in the arm through an adjustment ring on the upper part of the supporting arm. By rotation of this ring, the fine setting of the micro-indicator on the standard gage can be readily accomplished. When the setting is made, a special type of clamp secures the indicator firmly in the arm without vertical shift.

The Micro-Indicator for use with these stands are supplied graduated to 1/2000, 1/5000, 1/10000 or 1/20000 in. per division, as desired, and have ample range to cover a wide range of tolerances. Adjustable tolerance marks are provided in these indicators so that rapid inspection of parts can be carried out on these stands or they can be used for very accurate comparisons of gages or parts for which the greatest precision is demanded.

When desired, an adjustable square can be furnished as an accessory of these stands. This square is secured to the column and can be set at any height to serve as a stop piece against which the pieces being tested can be rolled or placed to put them in the right position for measurements on all cylindrical parts; for example, at the high point of a diameter or at any other desired point on pieces of other shapes. The stand is 13¾ inches high and weighs 32 lbs.

Geometric Combination Collapsing Tap

A special combination collapsing tap for threading two diameters at the same time has been developed by The Geometric Tool Company, New Haven, Conn. The tap, as shown in the illustration, is known as a 3 in. and 4 in. Class SD Tap, being equipped to cut 3 11/16-12 U. S. and 4⅝-12 U. S. threads at the same time. The chasers engage with the work simultaneously, or at such prearranged points as are necessary in order for the chasers to finish threading at the same time.

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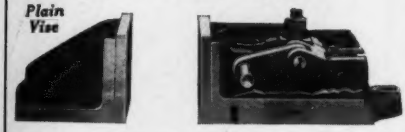
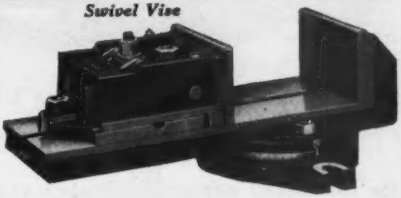


Swivel Vise



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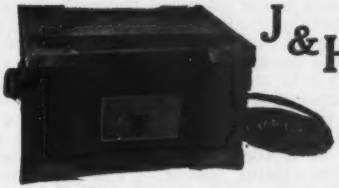

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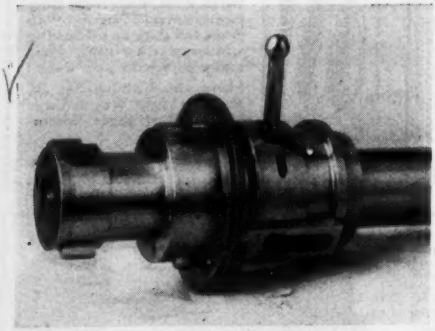
using a tap of this kind, its use is limited by several factors. For example, the pitch of the two threads must be the same, and the two holes to be tapped must be far enough apart to permit



"Geometric" Tap for tapping two diameters simultaneously.

the use of two sets of chaser slots and also two complete plungers for holding the chasers in the tool. Furthermore, the two holes should not be far enough apart to cause excessive overhang.

The two sets of chasers have independent size adjustment, the front chasers being adjusted through the cap, while the rear set is adjusted through the medium of an adjusting ring located on the back part of the body of the tap. Both sets collapse at the same time, the collapsing action being governed either by the contact of the trip plate with the face of the work, or through the use of a fork operating in the groove of the closing sleeve. The tap can be used for straight hole tapping, or for cutting taper threads such as pipe threads.

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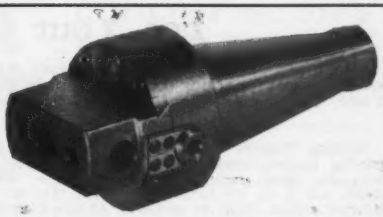

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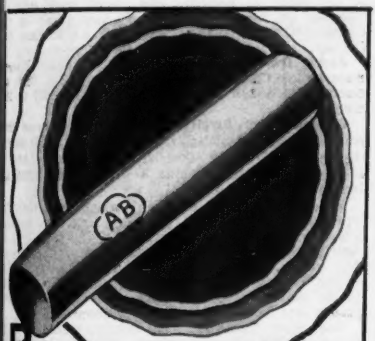

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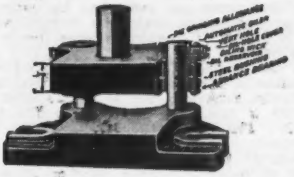

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Stop Tap Breakage: A booklet that tells how to stop the breakage of taps, reamers, and other tools, by the use of a friction chuck, also how to use the chuck for setting studs or nuts, has been issued by The Apex Machine Co., 200 Davis Ave., Dayton, Ohio. Sent free upon request.

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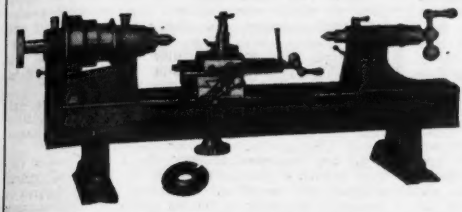
Interchangeable High Production Tools: Catalog No. 5 issued free by the Eclipse Counterbore Co., 7410



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IT IS so diversified in operation that it will handle many jobs in the factory and toolroom. The Hjorth lathe is never idle. Send for catalog.

HJORTH LATHE & TOOL CO. 60 STATE ST. BOSTON, MASS.

Greenerd Arbor Presses

Write for our Catalog showing 64 different styles

EDWIN E. BARTLETT CO.
NASHUA, N. H.

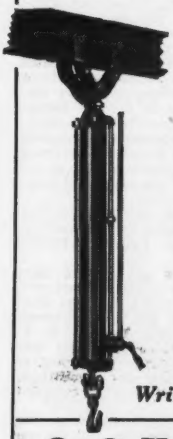
Mummert-Dixon Facing Heads

8 Sizes—6" to 40"

We can't say much here...but if you write for a bulletin we'll show you how this tool will save you money.

MUMMERT - DIXON CO.
120 Philadelphia Street
Hanover, Pa.

LIFT *by* AIR!



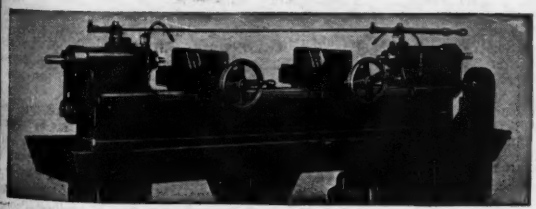
...use a KECKLEY PNEUMATIC HOIST... it's speedy, safe and economical.

KECKLEY Economy is also apparent when used in production or assembly work which requires the material to be lifted quickly, transported, and lowered at any particular spot.

The illustration shows KECKLEY Hoist type 3, pivot mounting arranged for monorail trolley. Built in various types and sizes.

Write for Bulletin 1304

O. C. KECKLEY CO.
563 Washington Blvd., CHICAGO, ILL.
Builders of
Hydraulic and Pneumatic Machinery



Sundstrand

Double End Centering Machine

For centering both ends of a shaft simultaneously. Spindles operate together or independently. L. H. head is removable for long shafts. Accommodates a wide variety of work. Special fixtures furnished when desired. Send for Bulletin.

SUNDSTRAND MACHINE TOOL CO. **Rockford, Illinois**

Aubin St., Detroit, Mich., describes and illustrates the interchangeable counterbores, spot facers, end form cutters, and other end cutting tools made by this firm.

Grooved Cast Iron Pulleys: All sizes of the cast iron grooved pulleys made by the Efficient Grooved Pulley Co., 147 Baxter Street, New York, N. Y., are described in a folder that has been issued by this firm. Copy free upon request.

Lathe Turrets of eight different types and twelve sizes are described and illustrated in Circular No. 18, issued by Fay & Scott, Dexter, Maine. Copies free upon request.

Precision Measuring Instruments: The latest types and models of dial indicators, thread lead test gages, pitch gages, thickness gages, dial comparators, and other precision measuring instruments marketed by the Federal Products Corporation, Providence, R. I., are described and illustrated in a book that will be sent free upon application to this firm.

The Involute Gear Simply Explained: A direct, clear explanation of the theory and principles of involute gearing without the use of higher mathematics can be obtained without charge by addressing The Fellows Gear Shaper Co., 78 River St., Springfield, Vt.

Reduce Your Bearing Costs: A bearing metal that is proof against burning, scoring, seizing, corroding, or pounding out is being made by the Fredericksen Company, 841 South Water Street, Saginaw, Michigan. Send for information.

Formica Silent Composition Gears: A booklet telling about the uses and advantages of Formica Silent Shock Absorbing Gears, and containing a considerable amount of valuable data with rules and tables for laying out, cutting and using gears. Sent free by Formica Insulation Co., 4632 Spring Grove Avenue, Cincinnati, Ohio.

Steel Stock List: Steel buyers who send their names and addresses to Peter A. Frasse & Co., Inc., 17 Grand St., New York City, will each receive a catalog of the warehouse stock maintained by this company. The catalog also contains valuable reference data.

Gear Chucks: Gears can be chucked from the pitch line by the use of a chuck that is made by the Garrison Machine Works, Inc., Dayton, Ohio. Descriptive booklet free upon request.

Adjustable Blade Cutters: Hollow mills, facing tools, face mills, milling cutters and other production tools with adjustable, interchangeable blades are described and illustrated in a booklet that is issued free by the Genesee Manufacturing Co., 141 N. Water St., Rochester, N. Y.

Take Care of Your Tools by keeping them in a convenient, strong, and fine-looking chest. A catalog of tool chests, complete with descriptions and illustrations, can be had by addressing H. Gerstner & Sons, 1283 Columbia Street, Dayton, Ohio.

Machine Vises of all sizes for use with machine shop equipment are described in a circular that will be sent free upon application to The Graham Mfg. Co., 69 Willard Ave., Providence, R. I.

Greaves-Klusman Lathes: A book containing complete descriptions of the latest types of lathes made by this firm has been issued by the Greaves-Klusman Tool Co., Oakley, Cincinnati, Ohio.

Swiss Files: The complete line of Grobet Swiss Files for use in die and tool work or for other fine work is described and illustrated in Catalog "K," published by the Grobet File Corporation of America, 3 Park Place, New York, N. Y. Copy free upon request.

Drawing Tables: The Hamilton steel-base, adjustable drawing table is described in Catalog No. 7-MS, issued by the Hamilton Mfg. Co., Two Rivers, Wis. Copy free upon request.

Texdrive Grinders for Vitrified or High Speed Wheels: A six-page bulletin No. 43 describes in detail and illustrates the advantages of the new Hisey Texdrive Grinder—stressing especially the multi-speed and single-speed machines. Write for a copy to The Hisey-Wolf Machine Co., Colerain and Marshall Sts., Cincinnati, O.

Precision Bench Lathe Work can only be done on finely-built, accurate machines. The complete line of Hjorth Precision Bench Lathes is described and illustrated in a catalog that has been issued by Hjorth Lathe & Tool Company, 24 School Street, Boston, Mass. Copy free upon request.

Useful Tool Information: The Illinois Tool Works, 2503 N. Keeler Ave., Chicago, has published a catalog which describes and illustrates the standard and special cutters, mills, hobs, gear cutters, thread cutters, saws, reamers, and other tools made by this firm. The book also contains a number of useful tables and formulas. Copy free upon request.

Slow Speed Drive Assembly: A motor, coupling, and speed reducer combined in one unit can now be obtained from the Janette Manufacturing Co., 558 West Monroe Street, Chicago, Ill. Ask for Bulletin SR-131.

Oil and Waterproof Chucks: The J & H Electric Co., 202 Richmond Street, Providence, R. I., is now making a chuck that is oil and waterproof, and is designed to provide a maximum of holding surface with exceptionally strong and uniform pull throughout. Ask for complete information.

Lift By Air with a Keckley Pneumatic Hoist, made by O. C. Keckley Co., 563 Washington Blvd., Chicago, Ill. Write for Bulletin 1304.

Special Mil-waukee-Mils of Standard Units: A milling machine of which the base, heads, columns, and other parts are built in standard units, thus enabling the user to order a machine that will be especially adapted for his job, is described and illustrated in Catalog No. 36, issued by the Kearney & Trecker Corporation, Milwaukee, Wis. Free to machine shop executives.

Keller Automatic Toolroom Machine for machining dies, metal patterns, jigs, core boxes, molds, and other irregular parts is fully described in a booklet that can be had free by addressing the Keller Mechanical Engineering Corp., 84 Front Street, Brooklyn, N. Y.

Koebel-Wagner Diamonds for Wheel Dressing: The Koebel-Wagner method of mounting diamonds and the use of the "Dykon" gage are discussed in a bulletin issued by the Koebel-Wagner Corporation, 144 Orange St., Newark, N. J. Free upon request.

Threading Machinery: Catalog No. 32, containing full descriptions of Landis threading machines, stay bolt threading machines, bolt factory threading machines, automatic forming and threading machines and chaser grinders can be had without charge by addressing Landis Machine Co., Inc., Waynesboro, Penna.

Flexibility in Cylindrical Grinding means increased production, need for less equipment, and lower costs. Send for information as to the advantages of Landis Hydraulic Grinders. Address Landis Tool Co., Waynesboro, Penna.

Cutter and Tool Grinding: A book that tells how to grind tools and cutters accurately and which also describes and illustrates the different types of LeBlond Universal Tool Room Grinders will be sent free upon request. Address, The R. K. LeBlond Machine Tool Co., Cincinnati, Ohio.

Lindner Toggle Vise: A toggle vise that can be adapted to any size within the capacity of the machine is described in a catalog that can be had by addressing The Lindner Manufacturing Co., Wyoming and Forrer St., Lockland, Ohio. Copy free upon request.

Air-Operated Work-Holding Devices: A booklet showing how air-operated chucks and devices of various kinds can be applied to different kinds of machines to save time and labor has been issued by The Logansport Machine Co., Logansport, Ind.

Rapid-Reading Micrometer: A new type of rapid-reading micrometer, designed to show the reading in numerals, is described in Catalog No. 5, issued by The Lufkin Rule Co., Saginaw, Michigan. The catalog also contains descriptions of the micrometers, calipers, gauges, scales, squares, bevel protractors, and other tools made by this company. Free upon request.

Time Saving Machine Equipment: How machining time can be reduced to the minimum by the use of Wilard chucks, collets and tap holders, turret tool posts, self-centering steadyrests, and other McCrosky equipment is told in a book that is issued by the McCrosky Tool Corporation, Meadville, Penna. Will be sent without charge.

M-C Pinion Rod, made by the Meisselbach-Catucci Mfg. Co., 70 Stanton St., Newark, N. J., insures economy and accuracy in cut pinions. Send for information.

FEDERAL DIAL INDICATORS

Comparators
Amplifying Gauges
Thickness Gauges
Depth Gauges
Thread Lead Gauges
Pitch Diameter Gauges
Cylinder Gauges
Paper Gauges
Fabric Gauges
Rubber Gauges
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Gear Tooth Comparators
Cutter Testing Gauges
Internal and External Grinding Gauges

Federal Products Corporation, Providence, R. I.

WESTERN BRANCHES { 7338 WOODWARD AVE., DETROIT, MICH.
520 WYSON BUILDING, MUNCIE, INDIANA

RIVETT COLLETS

"The finest collets in the world."
Full stock, at all times standard styles including Rivett, Hendey, Cataract Seneca, Becker, etc.

Write for new Bulletin,—100-AM "Rivett Draw-in Collets and Chucks"—also price list

Rivett LATHE AND GRINDER CORP.
Brighton Dist., Boston, Mass.

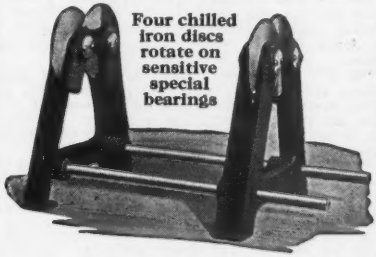
Anderson Improved Balancing Ways

No Leveling Required

A simple and excellent device for balancing, straightening and trueing.

They are made in the following sizes:

Swing	Greatest Distance Between Standards	Capacity in Lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000



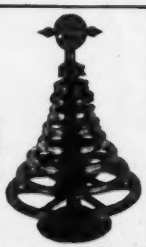
Four chilled iron discs rotate on sensitive special bearings

Write For Full Information

Mfd. By **Anderson Bros. Mfg. Co.**
1926 Kishwaukee Street, Rockford, Ill.

Come to Headquarters for

Grooved (Cast Iron) Pulleys



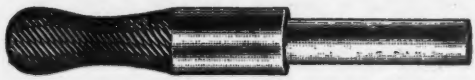
All Size Holes

Pulley Diam. inches	Size of Holes inches			
2½	¾	⅛	½	⅝
3	⅞			
4L	⅝	1	½	
4	½	⅝	¾	1
5	½	⅝	¾	1
6	½	⅝	¾	1
8	½	⅝	¾	1
10	½	⅝	¾	1
12	½	⅝	¾	1

Special Holes Bored

Mfd. By **Efficient Grooved Pulley Co.** 147 Baxter St. New York City

GROBET ROTARY FILES



WE now offer the new Grobet Swiss Rotary File, made by the makers of the famous Swiss Files of the same name, that have established world fame for the last century.

These rotary files and rasps are made in hundreds of different sizes and shapes to meet every condition and requirement.

We have a stock of all shapes and sizes on hand, including many new cuts and styles.

Let us send you our new Catalog R. K.

GROBET FILE CORP. of America **3 Park Place, New York City**

Midwest Pin Drive Keyway Cutters are described and illustrated in a catalog that can be had by addressing Midwest Tool & Mfg. Co., 2362 West Jefferson Ave., Detroit, Michigan.

Installation and Maintenance of Lathes: A newly, compiled booklet showing proper methods of installing, leveling and maintaining Monarch Lathes. It is useful information for every lathe user. Mailed free. Address The Monarch Machine Tool Company, Sidney, Ohio.

Compound Spot-Facing Tool: A spot-facing tool retracting, serrated roughing cutters and fixed finishing cutters in the same tool will break up the scale easily and do accurate work. Write for bulletin to Mummert-Dixon Co., 120 Philadelphia St., Hanover, Penna.

"The Answer to Your Gear Problems": Information as to correct methods of cutting and finishing gears will be supplied without charge by The National Tool Co., Cleveland, Ohio. This firm also carries a complete stock of gear shaper cutters and markets the National-Cleveland Spur and Helical Gear Grinding Machine.

Identify Your Product: The steel stamps, burning brands, metal checks, and name plates made by Ness & Merkert, 61 Fulton St., New York, N. Y., are described in a folder that can be had by writing this firm.

Save Time with Expanding Mandrels: How expanding mandrels will solve the problem of turning pieces with odd-size holes, and will increase production on duplicate work, is told in a folder that will be sent free upon request by W. H. Nicholson & Co., 136 Oregon St., Wilkes-Barre, Pa.

Ball and Roller Bearing Data Sheets: A complete set of data sheets showing all the dimensions and loads at given speeds, and giving instructions for mounting precision ball bearing and Hoffmann roller bearings, can be obtained without charge by addressing the Norma-Hoffmann Bearings Corporation, Stamford, Conn.

How To Grind Cemented Tungsten Carbide: A booklet which describes and illustrates the correct methods of grinding tungsten carbide tools has been published by the Norton Company, Worcester, Mass. Copy free upon request.

"O. K." Tool System: The O. K. System for lathes, planers, shapers, boring mills, and other production machines consists of special forged steel holders with complete sets of tool bits of special design. Particulars can be had by addressing The O. K. Tool Co., Shelton, Conn.

"Fastenings" is the title of a booklet, issued by the Parker-Kalon Corporation, 192-196 Varick Street, New York, N. Y., in which are included the results of surveys made in fourteen different plants as to the efficiency of fastening methods. Copy free upon request.

G-C Standardized Fixture Units in 677 sizes and 5 styles are described and illustrated in the Engineering Book put out by A. H. Pearson, 7 E. Grand Ave., Detroit, Mich. Copy free upon request.

"Most Frequent Mistakes Made in Hardening:" Users of steel can obtain a wall-chart on which are listed the most common mistakes made in hardening tool steels, results of mistakes as shown on the tools, appearance of fracture, and suggestions for remedying the mistakes, by writing to the Poldi Steel Corporation of America, 247 West 18th Street, New York, N. Y.

Do Your Bench Work on a Machine: Bench work that heretofore has been done by hand can now be done quicker, cheaper, and better on the P. & W. Vertical Shaper. Full particulars can be had by addressing Pratt & Whitney Co., Hartford, Conn.

Tapping Devices, Quick-Change Chucks, Stud-Setting Tools and Bench Tappers: A catalog describing the various types and kinds of tapping, drilling, and stud-setting devices manufactured by the Procunier Safety Chuck Company, 12 South Clinton Street, Chicago, Ill., can be obtained without charge by addressing this company. The catalog also tells the part that Procunier tools play in obtaining greater accuracy and less tap breakage.

"Ramet" Cutting Metal: A new cutting metal that is said to cut alloy steels, manganese steel, or any other metal composition, is described in a folder that will be sent free upon application to the Ramet Corporation of America, North Chicago, Ill.

Shape or Slot With This Machine: The Rhodes Convertible Shaper, made by The Rhodes Manfg. Co., Waltham, Mass., can be used for horizontal shaping or vertical slotting. Details upon request.

Bench Lathe Mounting and Driving Equipment: Bulletin 120-A, issued by Rivett Lathe and Grinder Corporation, Brighton, Mass., contains complete descriptions and illustrations of modern and conventional countershaft, individual motor drive jackshaft, and speed box motor drive, also benches, cabinets, oil pans, etc. Copy free upon request.

Fullmore Industrial Clutch: A multiple disc clutch, made in two types, to run in oil or dry, and which is so built that it can be operated at high speeds, is illustrated and described in a folder that will be sent free by the Rockford Drilling Machine Company, Rockford, Ill.

Hy-Draulic Shaper-Planer: The most modern features are embodied in the design of the Rockford Hy-Draulic Shaper-Planer, which is intended for work that would otherwise go to the small planer or large shaper. Write for folder to Rockford Machine Tool Co., 2414 Kishwaukee Ave., Rockford, Ill.

Foot-Controlled Air-Valves: Air-operated equipment can now be controlled by valves that are operated by the foot, leaving the hands free to operate the machine. Write for information to the Ross Operating Valve Co., 6448 Epworth Blvd., Detroit, Michigan.

Automatic Lubrication: Individually motor-driven pumps that keep the work flooded with lubricant are described in a booklet that has been published by the Rathbun Machinery Co., Front and Pike Sts., Cincinnati, Ohio.

Electric Tools: The complete line of "Ideal" electric drills, screwdrivers, nut setters, and grinders of various types is described and illustrated in Catalog No. 30, issued by The Schauer Machine Co., 907 Broadway, Cincinnati, Ohio. Copy free upon request.

Full Automatic Hobbing: Small pinions, gears, ratchet wheels, and similar parts can be hobbed economically on a full automatic hobber with magazine attachment. For full details write the George Scherr Company, 142 Liberty St., New York, N. Y.

Stamp Your Name on Your Product: Full information as to the steel roller dies made by The Schwerdt Stamp Co., 10 Cannon Street, Bridgeport, Conn., can be obtained by writing this firm.

Rapid Drill Jigs: How time can be saved and drilling operations made easier by the use of a quick-acting drill jig is told in a booklet that is issued free by the Slewek Tool & Die Co., 10230 Woodward Ave., Detroit, Michigan.

Simonds Files: A useful book on files showing the various styles made, their uses, cross-section, and cuts, and containing a number of reference tables and other information useful in a machine shop can be had by addressing Advertising Dept., Simonds Saw & Steel Co., 470 Main Street, Fitchburg, Mass.

The Most Efficient Speed for the operation of special production units, power conveyors, and other machinery by the use of the WHS Speed Reducer and how it can be obtained is told in a bulletin that will be mailed free by Winfield H. Smith, Inc., 30 Eaton St., Springville, N. Y.

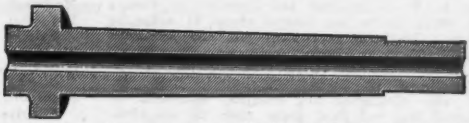
A Snyder Tool Set-Up, consisting of a Snyder ball-bearing multiple head, bushing plate, and work holding fixture, will convert a single spindle drill into a multiple drill at small cost. Particulars upon request. Address Snyder Tool & Eng. Co., 3400 E. Lafayette Ave., Detroit, Michigan.

Speed and Accuracy in Straightening: The Springfield Straightening Press is an ideal tool for use in straightening any length or size of rough or finished work. Send for illustrated folder. Address The Springfield Machine Tool Co., 630 West Southern Avenue., Springfield, Ohio.

Stackbins Save Space: Bins which may be used as individual containers, as tote-boxes, or "nested" to form stock-room sections are described in an illustrated circular published by the Stackbin Corporation, Pearl and Rice Streets, Providence, R. I.

Accurate Gages Speed Production: The complete line of snap, plug, ring, pin, dial indicator, and special

Let Us Save You MONEY



NO MATTER what you require in the way of Hollow-Bored parts . . . spindles, rams, clutch shafts, etc. . . . American Hollow Boring will *save you money.*

Here you can obtain better hollow-bored parts, made to your *exact* specifications, quicker and cheaper than making them yourself. Let us prove it . . . send your blue-prints for complete data and prices.

AMERICAN HOLLOW BORING CO., 2000 Raspberry St., Erie, Pa.

Steelgrip Universal Puller

An improved puller for removing gears, wheels or pulleys any distancefrom the end of shaft.Quickly paysforitself! Write for prices.

Armstrong-Bray & Co., 669 Eagle Street Chicago, Illinois

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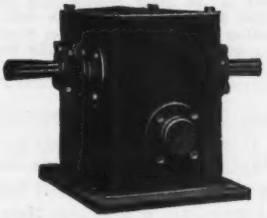
is a standard ratio of reduction in

WHS

SPEED REDUCER, No. 4D



Send for Catalog No. 25

Winfield H. Smith, Inc.

30 EATON STREET
SPRINGVILLE, ERIE CO., NEW YORK

GEARS

Speed Reducers
V-Belt Drives

Send for Catalog

Eberhardt-Denver Gear Works

1488 W. Colfax Denver, Colorado

Mounted Grinding Wheels

For all small holes (open or blind), races, bushings, etc., and most any place hard-to-get-at; as on dies, tools, gears, etc. Hundreds of sizes, shapes, any shank.

CHICAGO WHEEL & MFG. CO.

406 East Woodbridge St. DETROIT
110 South Aberdeen St. CHICAGO

gages made by the Standard Gage Co., Inc., Poughkeepsie, N. Y., is described and illustrated in Catalog No. 4, which can be had without charge by addressing this firm. Johansson gage block sets and accessories are also listed in this book.

Machinists' Tools and Gages: Catalog No. 24, issued by the L. S. Starrett Co., Athol, Mass., describes and illustrates the complete assortment of machinists' fine tools and gages made by this firm. Copy free upon request.

Rigidmilling Principles and Practice: A book that shows how the Rigidmil can be adapted to various kinds of usual and unusual milling operations, and which describes in detail the work that can be handled by this machine has been issued by the Sundstrand Machine Tool Co., Rockford, Ill. Copy free upon request.

Cutting and Grinding Facts: A discussion of cutting oils and lubricants, together with descriptions and illustrations of various kinds of jobs upon which cutting oils are used, is contained in a booklet that is issued by the Sun Oil Company, Finance Building, Pittsburgh, Pa. Free upon request.

Snap, Plug, Ring, and Thread Gages: The complete line of precision gages made by The Taft-Peirce Manufacturing Co., 32 Mechanic Ave., Woonsocket, R. I., is described in a folder which can be obtained, free, by addressing this company.

Penetrating Oil for High-Speed Equipment: Three-In-One Oil, blended scientifically from animal, mineral and vegetable oils, will penetrate the tightest bearings and lubricate high speed units perfectly. Full information can be had by writing Three-In-One Oil Co., Dept. 96, 130 William St., New York, N. Y.

Powerful, Easy-Acting Chain Hoists of the most modern design are described and illustrated in a booklet that is issued by the Union Manufacturing Co., 296 Church St., New Britain, Conn. Copy free upon request.

Change drilling speeds instantly without stopping the machine or touching a belt. This can be done with the Victor Super-Drill, made by U. S. Automatic Box Machinery Co., Newtonville, Boston, Mass. Bulletin free upon request.

Multiple Drilling With a Single-Spindle Drill: Methods by which multiple drilling may be done on a single-spindle drill, using multiple spindle drill heads, are discussed in a bulletin that is issued by The United States Drill Head Co., 1954 Riverside Drive, Cincinnati.

Electrically-Driven Portable Tools: The "U. S." line of electric drills, die grinders, electric screw drivers, surface grinders, tool post grinders, and bench and floor grinders is described in Catalog No. 29, which has been published by The United States Electrical Tool Co., 2471 W. Sixth St., Cincinnati, Ohio.

How To Measure Threads with Wires: Circular W24, issued by The Van Keuren Co., Watertown, Mass., tells how to obtain the correct thread pitch diameter with a micrometer and wires. Copy free upon request.

Power Drive in Any Position: The modern flexible shaft makes it possible to drive all kinds and types of tools in places and positions impossible of access with straight-shaft machines. Ask The S. S. White Dental Mfg. Co., Industrial Division, 150A West 42nd Street, New York, N. Y., for the "Flexible Shaft Handbook." Copy free to any mechanical executive addressing this firm on his firm letterhead.

Change Punches Without Removing Die: The user of Hercules Interchangeable Punches and Retainers can change punches without removing the die from the press. Information that will help to lower die-building costs, reduce lost time for repairs, and increase press production can be had by addressing Whitman & Barnes, Inc., Detroit, Michigan.

Wrenches For Every Use: "Guaranteed Against Breakage" tappet wrenches, pipe and fitting tongs, offset wrenches, and wrenches for all other uses are described and illustrated in a series of folders which can be obtained without charge by addressing J. H. Williams & Co., Buffalo, N. Y.

Scrap

(*Continued from page 50*)

money faster than he could make 'em. Between times he worked out benders and flatteners to shape up the stuff. Finally all the scrap was gone and Scotty started buyin' strip scrap wherever he could get it, and then he started to run his presses to make scrap to make baskets out of and that give him another idee. He started makin' washers from punchin's that couldn't be used for anything else and sold 'em for the cost of the material. Call me a liar if you want to," said Jim, "But he even made parts for — cars."

Just then the one-o'clock whistle blew and we never found out what else Scotty McMillin made from scrap.

Wright Electric Hoists

The Wright Manufacturing Company, Bridgeport, Conn., has issued a catalog on Wright Electric Hoists. The catalog contains 48 pages and gives complete descriptions of Wright electric hoists as well as dimensions and other useful data. The hoists include hook and bolt suspension; plain, geared, and motor-driven trolleys, and drum and low headroom types.

Protective Paint Absorbs Ultra-Violet Arc-Welding Rays

A paint that has been developed especially for protection against the radiation of the dangerous, invisible ultra-violet rays from arc-welding has been announced by the Merchandise Department of the General Electric Company, Schenectady, N. Y. The paint is intended for use on the walls and ceiling of rooms in which arc-welding equipment is used, and has been designated as G. E. No. 881 UVR Protective Paint. The paint is gray, of the variety known as "oil-type," and is said to have good adhesive qualities with no tendency to powder off the surface. Petroleum spirits are used for thinning the paint, which dries in approximately two hours.

Hotel Hollenden

Theo. DeWitt Vice Pres.

CLEVELAND

Announces

Revised Rates!

Following the trend of the times, Cleveland's leading hotel announces the following changes in room rates ---*effective immediately*

FORMER		
$3.50	ROOMS NOW	$3.00
$4.00	ROOMS NOW	$3.50
$4.50	ROOMS NOW	$4.00

Four-Station selective Radio now being installed in every Hotel Hollenden room.

Service

HOTEL FORT SHELBY'S patronage represents a myriad of people who make the Fort Shelby their home whenever they visit Detroit. No finer tribute could be paid any hotel; it is compelling proof of Fort Shelby's ability to render the ultimate in service ... efficiently and unobtrusively. ¶ Its location in the heart of Detroit's shopping, theatre, financial, insurance and wholesale districts is a happy one ... 900 units ... all with servidor, private bath and circulating ice water. Rooms as low as $3.00 per day ... suites $10.00 and upwards.

Motorists are relieved of their automobiles at the door without service charge. Write for free road map, and your copy of "Aglow with Friendliness," our unique and fascinating magazine.

HOTEL Fort Shelby

E. J. BRADWELL, Manager

DETROIT

"AGLOW WITH FRIENDLINESS"

By GEO. ALEXANDER MANN

You can't expect tonsil-snatchers to make a cheerful appearance—they hafta look down in the mouth.

She's There

She's up on conversation,
In its every phase,
She can say, "Oh yeah?"
Four different ways!

Buyin' twice as much for the dollar means nothin' if it's four times as hard to get the dollar.

Sez Mel

Many janes're cold,
Clear out o' reason,
Squeezin' their waists
Is wastin' your squeezin.

A woman hangs on to her youth—even when he's driving.

There's a Puzzler

Which o' the two is worser,
We'll never know, I fear,
The bride's first batch o' biscuits,
Or the groom's first batch o' beer.

Yuh listen to some o' these important talkin' guys an' yuh gain the impression that it rains because they let it.

One o' the biggest kicks I ever got was when the doctor's assistant told me to look pleasant as he proceeded to take an X-Ray o' my liver.

The drug stores are there with the service these days—you get your indigestion at the fountain and a remedy for it on the way out.

Some Penman—Elmer

Louise is sore at Elmer,
Drove him from the house,
When he wrote "Dear Louise"
It looked more like "Dear Louse."

Hoo-ray for the Red, White and Blue—Red Ink, White Lies and Blue Pencil—

An Dooze I?

I call her "Sweet Melon,"
She's my weakness new,
When I hint for a kiss,
She says "Honey do."

Don't give up—biz is going with a bang in Chicago.

That Makes Ut Unanimous

'Tis said that it takes the traffic cops to dam the flow of traffic. Huh—if you haven't heard the drivers you ain't heard nothin' yet.

Service

"Have you any wild duck?"
"No," said Waiter Witt,
"But we got some tame ones,
We might tease a bit."

The trouble today is that those with confidence have no money an' those with money have no confidence.